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WASHINGTON

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ARCTIC OCEAN

KOTZEBUE

Arctic Circle

Coal

Gold

Government Sta.

Franklin Pt

Ft Belcher

Attanik

Ft Collie

Wainwright Inlet

Blossom Shoal

Icy Cape

Pt Lay

Thetis Coal

C Beaufort

Kukpowruk R.

C Lisburne

C Lewis

C Dyer

Pitmegea R.

Ippewik R.

Pt Hope

Kookpuk R.

Mt Kelly

C Thompson

C Seppings

Kevulega R.

Wolcott

Corwin Lagoon

Killeroke Hills

Jade Mts 3500

Deviation Pk

C Krusenstern

C Blossom

C Espenberg

Good Hope Bay

Chamisso Is

C Lowenstern

Shishmaref Inlet

G Uselkin

East Cape 2521

C Prod Wales

Shoal

Big Diomede

Little Diomede

C Nunivak

Fairway Pk

St Lawrence Bay

C Krusenstern

C York

Port Clarence

Pt Spencer

Mt Bendeleben

Attemut

Mt Hosmillo

Yukon

Kuskokwim Hills

Ikpikpuk R.

Colville R.

Meade R.

Killik R.

Chandler R.

Anaktuvuk R.

Etivluk R.

Nanushuk R.

Kukpuk R.

Utukok R.

Kokolik R.

Wulik R.

Kivalina R.

Noatak R.

Kobuk R.

Selawik L.

Hotham Inlet

Kotzebue Sd

Baldwin Pen

Seward Pen

Kotzebue

Deering

Candle

Shungnak

Ambler R.

Koyukuk R.

Alatna R.

Hughes

Allakaket

Bettles

Evansville

Wiseman

Coldfoot

Chandalar R.

Sheenjek R.

Porcupine R.

Dall R.

Fort Yukon

Rampart

Tanana

Minto

Nenana

Tolovana

Manley Hot Springs

Rampart

Hot Springs

Tanana R.

Kantishna R.

Toklat R.

Nenana R.

Totatlanika R.

Chena R.

Salcha R.

Delta R.

Tanana Hills

Yukon Flats

Yukon Hills

Tolovana Hills

Kokrines Hills

Ray Mts

Ray R.

Hess Cr.

Beaver Cr.

Victoria Cr.

Hunt Fork

Sheenjek R.

Porcupine R.

Romanzof Mts.

Franklin Mts

Mt. Chamberlin

Lower Ramparts

Fickett R.

Sagavanirktok R.

Itkillik R.

Anaktuvuk Pass

Killik R.

Chandler R.

Colville R.

Meade R.

Ikpikpuk R.

Tuktoyaktuk Pen

Harrison Bay

Pitt Pt.

Smith Bay

C Simpson

Thetis Is

Reindeer Pt

Midway Is

Cross I

Barrow

Point Barrow

Elson Lagoon

Dease Inlet

Tigvariak Pt

Kuparuk R.

Franklin Bluffs

Sagavanirktok R.

Flaxman I

Camden Bay

Barter I

Barter Is

Demarcation Point

Kaktovik

Barter Island

Brownlow Pt

Angun Pt

Lion Rock

Jago R.

Canning R.

Hulahula R.

Aichilik R.

Okpilak R.

Staines R.

Turner R.

Sadlerochit Mts

Shublik Mts

Romanzof Mts

Franklin Mts

Mt. Chamberlin

Mt. Doonerak

Arrigetch Peaks

Endicott Mts

Brooks Range

Schwatka Mts

Waring Mts

Baird Mts

Igichuk Hills

Buckland R.

Selawik R.

Hotham Inlet

Kotzebue Sd

Baldwin Pen

Seward Pen

Kotzebue

Deering

Candle

Shungnak

Ambler R.

Koyukuk R.

Alatna R.

Hughes

Allakaket

Bettles

Evansville

Wiseman

Coldfoot

Chandalar R.

Sheenjek R.

Porcupine R.

Dall R.

Fort Yukon

Rampart

Tanana

Minto

Nenana

Tolovana

Manley Hot Springs

Rampart

Hot Springs

Tanana R.

Kantishna R.

Toklat R.

Nenana R.

Totatlanika R.

Chena R.

Salcha R.

Delta R.

Tanana Hills

Yukon Flats

Yukon Hills

Tolovana Hills

Kokrines Hills

Ray Mts

Ray R.

Hess Cr.

Beaver Cr.

Victoria Cr.

Hunt Fork

Sheenjek R.

Porcupine R.

Romanzof Mts.

Franklin Mts

Mt. Chamberlin

Lower Ramparts

Fickett R.

Sagavanirktok R.

Itkillik R.

Anaktuvuk Pass

Killik R.

Chandler R.

Colville R.

Meade R.

Ikpikpuk R.

Tuktoyaktuk Pen

Harrison Bay

Pitt Pt.

Smith Bay

C Simpson

Thetis Is

Reindeer Pt

Midway Is

Cross I

Barrow

Point Barrow

Elson Lagoon

Dease Inlet

Tigvariak Pt

Kuparuk R.

Franklin Bluffs

Sagavanirktok R.

Flaxman I

Camden Bay

Barter I

Barter Is

Demarcation Point

Kaktovik

Barter Island

Brownlow Pt

Angun Pt

Lion Rock

Jago R.

Canning R.

Hulahula R.

Aichilik R.

Okpilak R.

Staines R.

Turner R.

Sadlerochit Mts

Shublik Mts

Romanzof Mts

Franklin Mts

Mt. Chamberlin

Mt. Doonerak

Arrigetch Peaks

Endicott Mts

Brooks Range

Schwatka Mts

Waring Mts

Baird Mts

Igichuk Hills

Buckland R.

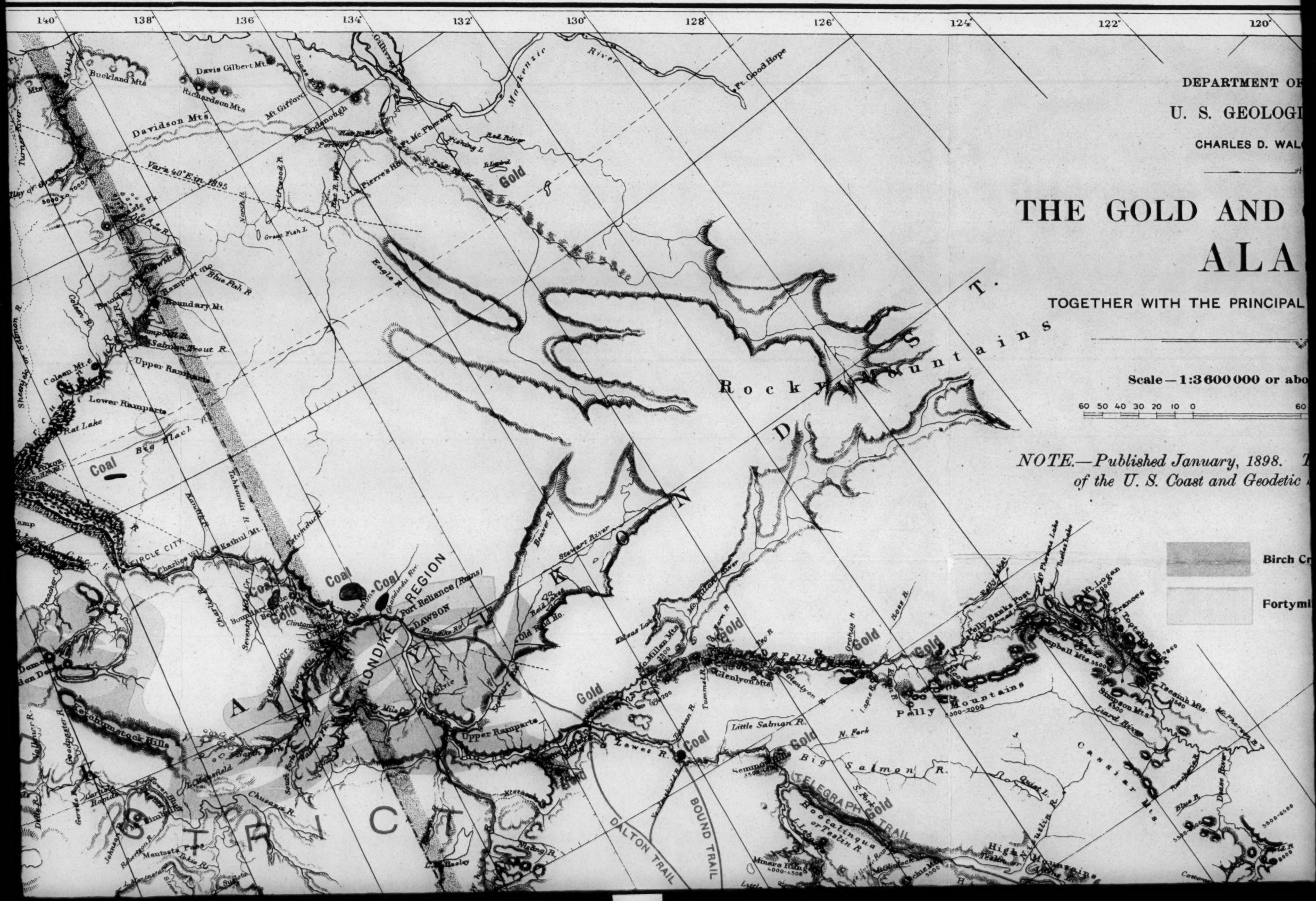
Selawik R.

170° 168° 166° 164° 162° 160° 158° 156° 154° 152° 150° 148° 146° 144° 142°

72° 70° 68° 66°

154° 152° 150° 148° 146° 144° 142° 140° 138° 136° 134° 132° 130°

Point Barrow
Cape Lisburne
Wainwright Inlet
Icy Cape
Point Hope
Kotzebue Sound
Cape Thompson
Smith Bay
Point Lay
Wainwright Inlet
Icy Reef
Harrison Bay
Thetis Island
Reindeer Is.
Escher Pt.
Midway Islds
Return Reef
Cross I.
Anjew Pt
Lion Reef
Flaxman I.
Camden Bay
Herschel I.
Demarcation Pt.
British Mts
Buckland Mts
Davis Gilbert Mt.
Richardson Mts
Mt. Gifford
Mt. Goodenough
Porcupine R.
Mackenzie River
Fishing L.
Red River
Mt. McPherson
Lapierre's House
Gold
Romanzof Mts.
Franklin Mts
Mt. Greenough
3200
3400
3900
4800
4840
Davidson Mts.
Turner River
Valley of Chandalar R.
Var'n 40° E. in 1895
Driftwood R.
North Fk
Eagle R
Blue Fish R
Boundary Mt
Colen R.
Sheenjek or Salmon R.
Salmon Trout R.
Upper Ramparts
Colen Mts
Lower Ramparts
Rat Lake
Big Black R.
Var'n 35° E. in 1895
Coal
Arctic Circle
Kanuti R.
Tahkandit R.
Ratshetuc R.
Kanuti Camp
CIRCLE CITY
Rathul Mt.
Charley R.
Beaver Cr.
Dall R.
Ray R.
Porcupine Dome
Mastodon Dome
Lower Ramparts
Coal
Yukon
Koyukuk
Hogatza R.
Hughes
Husbal R.
Yukon Hills
Kelatkatat R.
Yukon Flats
Tozikakat R.
Dogan R.
Tozikat R.
Hess Cr.
Beaver Cr.
Coal
Gold
Bonanza Hills
Porcupine Dome
Mastodon Dome
Ketchumstock Hills
Goodpaster R.
Walker R.
Delta R.
Johnson R.
Tanana
Chatanika R.
Fairbanks
Chena R.
Salcha R.
Richardson
Mentasta Pass
Tokio R.
Slana
Mt. Hayes
Mt. McKinley
Nenana R.
Wolaaska R.
Seventymile R.
Mt. Hayes
Nutzotin Mts
Mentasta Mts
Tanana Valley R.R.
Fairbanks
Chena
Salcha
Richardson
Tanana
Nenana
Healy
Lignite
Coal
Gold
Bonanza Cr.
Hunker Cr.
Bonanza Cr.
Gold Run Cr.
Dominion Cr.
Sulphur Cr.
Quartz Cr.
Eldorado Cr.
Bear Cr.
Last Chance Cr.
Gold Bottom Cr.
Hunker Cr.
Gold Run Cr.
Dominion Cr.
Sulphur Cr.
Quartz Cr.
Eldorado Cr.
Bear Cr.
Last Chance Cr.
Gold Bottom Cr.
Klondike R.
Indian R.
Stewart River
Beaver R.
Stewart River
Klondike Mts
Klondike Region
Port Reliance (Ruins)
Dawson
Moosehide
Old Fort Reliance
Old Forty Mile
Forty Mile
Fortymile R.
Chandalar R.
Seventymile R.
Boulder Cr.
Bonanza Cr.
Hunker Cr.
Gold Run Cr.
Dominion Cr.
Sulphur Cr.
Quartz Cr.
Eldorado Cr.
Bear Cr.
Last Chance Cr.
Gold Bottom Cr.
Indian R.
Stewart River
Beaver R.
Klondike Mts
Klondike Region
Port Reliance (Ruins)
Dawson
Moosehide
Old Fort Reliance
Old Forty Mile
Forty Mile
Fortymile R.
Chandalar R.
Seventymile R.
Boulder Cr.
Gold
Upper Ramparts
Lewes R.
Chisana R.
Mentasta Pass
Tokio R.
Slana
Mt. Hayes
Mt. McKinley
Nenana R.
Wolaaska R.
Seventymile R.
Nutzotin Mts
Mentasta Mts
Tanana Valley R.R.
Fairbanks
Chena
Salcha
Richardson
Tanana
Nenana
Healy
Lignite
Coal
Gold
Dalton T.
Milepost
Kluane L.
Kluane Lake
Mt. McKinley
Nenana R.
Wolaaska R.
Seventymile R.
Nutzotin Mts
Mentasta Mts
Tanana Valley R.R.
Fairbanks
Chena
Salcha
Richardson
Tanana
Nenana
Healy
Lignite
Coal
Gold
Dalton T.
Milepost
Kluane L.
Kluane Lake


140°
138°
136°
134°
132°
130°
128°
126°
124°
122°
120°
DEPARTMENT OF
U. S. GEOLOGI
CHARLES D. WAL
THE GOLD AND
ALA
TOGETHER WITH THE PRINCIPAL
Scale — 1:3600000 or abo
60 50 40 30 20 10 0 60
NOTE.—Published January, 1898.
of the U. S. Coast and Geodetic
Birch Cr
Fortymi
Rocky Mountains
Mackenzie River
Ft. Good Hope
Davis Gilbert Mts
Buckland Mts
Richardson Mts
Davidson Mts.
Mt. Gifford
Mt. Goddenough
Ft. McPherson
Red River
Fishing L.
Gold
Eagle R.
Blue Fish R.
Boundary Mt.
Sabukan Trout R.
Upper Ramparts
Lower Ramparts
Rat Lake
Coal
CIRCLE CITY
Kathul Mt.
Fortymile R.
Seventymile R.
Coal
Coal
Coal
Gold
Gold
Gold

NAT. GEOG. MAG.
VOL. IX, 1898, PL. 4.
REPRINT

DEPARTMENT OF THE INTERIOR

U. S. GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

THE GOLD AND COAL FIELDS OF ALASKA

TOGETHER WITH THE PRINCIPAL STEAMER ROUTES AND TRAILS

Scale—1:3600000 or about 57 miles to one inch

60 50 40 30 20 10 0 60 120 180

NOTE.—Published January, 1898. The base is a copy of a part of chart T of the U. S. Coast and Geodetic Survey, edition of June, 1897.

Birch Creek series
Fortymile series
} Both are gold bearing

134° 132° 130° 128° 126° 124° 122° 120° 118° 62° 60° 58°

Gilbert's Pass
Mackenzie River
Ft. Good Hope
Ft. McPherson
Fishing L.
Red River
Eldorado
Gold
La Pierre's House
Eagle R.
Rocky Mountains
Stewart River
Beaver R.
Mc Millan Mts
Klondike Coal Region
Fort Reliance (Ruins)
DAWSON
Klondike River
Old Road Ho.
Gold
Glenlyon Mts
Glenlyon R.
Pelly R.
Pelly Banks Fort (Abandoned)
Pelly Mountains
Mt. Logan
Mt. Pherson Lake
Mt. Francis
Campbell Mts
Simpson Mts
Teesmith Mts
Lizard River
Upper Ramparts
Lewes R.
Coal
Little Salmon R.
N. Fork
Big Salmon R.
Cassiar Mts
Quiet L.
Blue R.
Dease River
Teslin L.
Hootalinqua or Teslin R.
TELEGRAPH TRAIL
DALTON TRAIL
BOUND TRAIL
Minnes Rivers
High Mountains
Nisling R.
Lake Bennett
Lake Marsh
Lake Tagish
Lake Atlin
Lake Taku
Lake Tahltan
Lake Dease
Lake Thutade
Lake Kawdy
Lake Kawdy
Lake Kawdy

Coal
Gold
KOTZEBUE
NORTON SOUND
FORT ST. MICHAEL MILITARY RESERVATION
BERING STRAIT
Arctic Circle
Coal
Gold
Gold
Coal
Coal
Gold
Coal
Gold
Coal
Gold

Arctic Circle

York 35° E in 1895

York 30° E in 1895

Upper Ramparts

Lower Ramparts

Rat Lake

Big Black R.

Coal

Gold

CIRCLE CITY

Kathul Mt.

Tahkandit R.

Kandike R.

Chatanduk R.

Beaver Cr.

Porcupine Dome

Mastodon Dome

Yukon Hills

Ogilvie Mts.

Tanana Hills

Coldfoot Hills

Goodpaster R.

Delta R.

Tanana R.

Yukon R.

Koyukuk R.

Kuskokwim R.

Mt. McKinley

Mt. Hayes

Mt. Sanford

Mt. Wrangell

Mt. Drum

Mt. Tilman

Mt. Blackburn

Mt. Natazhat

Mt. St. Elias

Scolai Pass

Malaspina Glacier

Chisana R.

Nabesna R.

Copper R.

Chitina R.

Stuck

Sushitna R.

Little Susitna R.

Mt. Susitna

Cape Suckling

Cape St. Elias

Montague I.

Wooded Ids.

Prince William Sound

Valdez

Port Valdez

Port Wells

Port Fidalgo

Port Bainbridge

Port Ashton

Port Chalmers

Port Nellie Juan

Port Dick

Port Graham

Kenai Peninsula

Kenai Mts.

Kenai

Cook Inlet

Kachemak Bay

Homer

Seldovia

Iliamna Lake

Iliamna Volcano

Redoubt Volcano

Kamishak Bay

Shelikof Strait

Kodiak I.

Shumagin Is.

Unimak I.

Aleutian Range

Alaska Peninsula

Bristol Bay

Nushagak R.

Togiak R.

Kuskokwim Bay

Yukon Delta

Norton Sound

Port Clarence

Cape Prince of Wales

Diomede Is.

St. Lawrence I.

Nunivak I.

Hooper Bay

Kotzebue Sound

Kobuk R.

Noatak R.

Selawik L.

Hotham Inlet

Baldwin Pen.

Point Barrow

Point Hope

Wainwright Inlet

Colville R.

Meade R.

Chandalar R.

Koyukuk R.

Tanana R.

Yukon R.

Fort Reliance (Ruins)

DAWSON

KLONDIKE REGION

Hunker Cr.

Bonanza Cr.

Eldorado Cr.

Sulphur Cr.

Dominion Cr.

Quartz Cr.

Indian R.

Stewart R.

Mayo

Beaver R.

Old Road Ho.

Upper Ramparts

Gold

Coal

Copper

Chisana

Nabesna

Mt. Natazhat

Mt. St. Elias

Malaspina Glacier

Cape St. Elias

Cape Suckling

Montague I.

Wooded Ids.

Prince William Sound

Valdez

Port Valdez

Port Wells

Port Fidalgo

Port Bainbridge

Port Ashton

Port Chalmers

Port Nellie Juan

Port Dick

Port Graham

Kenai Peninsula

Kenai Mts.

Kenai

Cook Inlet

Kachemak Bay

Homer

Seldovia

Iliamna Lake

Iliamna Volcano

Redoubt Volcano

Kamishak Bay

Shelikof Strait

Kodiak I.

Shumagin Is.

Unimak I.

Aleutian Range

Alaska Peninsula

Bristol Bay

Nushagak R.

Togiak R.

Kuskokwim Bay

Yukon Delta

Norton Sound

Port Clarence

Cape Prince of Wales

Diomede Is.

St. Lawrence I.

Nunivak I.

Hooper Bay

Kotzebue Sound

Kobuk R.

Noatak R.

Selawik L.

Hotham Inlet

Baldwin Pen.

Point Barrow

Point Hope

Wainwright Inlet

Colville R.

Meade R.

Chandalar R.

Koyukuk R.

Tanana R.

Yukon R.

TOGETHER W

Rocky Mountains

Scal

60 50 40 30

NOTE.—Publishe
of the U. S

Var'n 35° E. in 1895

Var'n 30° E. in 1895

Coal

Gold

Beaver Cr.

Porcupine Dome

Mastodon Dome

Ogilvie Mts

Tombstone Hills

Dawson

Fort Reliance (Ruins)

LONDKE REGION

Upper Ramparts

Lower Ramparts

CIRCLE CITY

Rat Lake

Big Black R.

Coleen Mt.

Salmon Trout R.

Sheenjek or Salmon

Kandik R.

Tahkandit R.

Tatonduc R.

Kathul Mt.

Charley R.

Seventymile R.

Boundary Cr.

Clinton Cr.

Chandindu R.

Hunker Cr.

Bonanza Cr.

Indian R.

Stewart River

Beaver R.

Reid Lake

Old Road to

Kalzas Lake

McMillan River

McMillan Mts

Glenlyon Mts

Tummel R.

Pelly R.

Lapie R.

Orchias R.

Hess R.

Pelly Banks Post (Abandoned)

Pelly Lakes

Mt. Logan

Stephen Mts

Simpson Mts

Lizard Hills

Pelly Mountains

Little Salmon R.

N. Fork

Big Salmon R.

Lower R.

Semenof Mts

Casslar Mts

Quiet L.

TELEGRAPH TRAIL

Hootalinqua or Teslen R.

Miners Hdqrs

Little R.

White Rapids

Watson

Mt. Ingraham

Mt. Michie

Achaie L.

High Mountains

High Range

BRITISH GOVT. REPORTED EASY PORTAGE

DALTON TRAIL

KLONDIKE BOUND TRAIL

DYEA TRAIL

CHILKOOT TRAIL

CHILKAT TRAIL

DYEA

SKAGWAY

Skagway R.

Chilkoot Pass

Chilkat Pass

Chilkat R.

Chilkat Inlet

Lynn Canal

Taiya Inlet

Dalton's Trading Post

Klukwan

Porcupine R.

Koidern R.

Kluane R.

Kluane L.

Mandenhall Rv

Mt. Wrangell

Mt. Samford

Mt. Drum

Mt. Tillman

Mt. Blackburn

Mt. Natazhat

Mt. St. Elias

Scolai Pass

Tazlina R.

Nakina R.

Chitina R.

Copper R.

Bremner R.

Klutina R.

Kotsina R.

Tonsina R.

Chistochina R.

Gakona R.

Gulkana R.

Susitna R.

Little Susitna R.

Matanuska R.

Talkeetna R.

Mt. Susitna 3500

Campbell Pt.

Knik Arm

Port Wm.

Port Valdez

Valdez

Valdez Bay

Port Valdez Bay

Valdez Inlet

Valdez Glacier

Valdez Glacier R.

Miles Glacier

Malaspina Glacier

Ley Bay

Ley Strait

Pt. Manby

Ocean Cape

Cape St. Elias

Yakutat Bay

Yakutat Vill.

Kayak I.

Wingham I.

Hinchinbrook I.

Seal Rks

Alaganik

Copper Vill.

Eyak

Eyak R.

Eyak Lake

Orca

Cordova

Controller Bay

Katalla

Katalla R.

Bering R.

Kushtaka

Kushtaka R.

Mentasta Pass

Mentasta Lake

Slana R.

Slana

Nabesna R.

Chisana R.

Robertson R.

Johnson R.

Gerstle R.

Goodpaster R.

Delta R.

Tanana R.

Healy Fork

Healy R.

Nenana R.

Toklat R.

Kantishna R.

Kantishna

Dunkle

Fairbanks

Fairbanks Creek

Cleary Cr.

Chatanika R.

Chatanika

Tolovana R.

Minook Cr.

Minook

Hot Springs

Rampart

Rampart City

Hamlin

Koyukuk R.

Yukon R.

Yukon Flats

Yukon Crossing

Big Salmon

Nisutlin R.

Nisutlin Bay

Teslin L.

Teslin R.

Teslin

Hootalinqua

Tagish L.

Tagish

Marsh L.

Windy R.

Caribou Crossing

Caribou R.

Stewart R.

Mayo

Mayo L.

Mayo R.

Duncan Cr.

Duncan Creek

Forty Mile

Forty Mile Cr.

Fortymile R.

Fortymile

Sixtymile R.

Sixtymile

Sixtymile Cr.

Indian R.

Indian River

Eagle

Eagle City

Eagle Plains

Dawson Range

Ogilvie Mts

Wernecke Mts

Peel R.

Rapid R.

Bell R.

Porcupine R.

Old Crow

Old Crow Flats

Rampart House

Peel River

Mackenzie R.

Arctic Ocean

Herschel I.

Flaxman I.

Beechey Pt.

Barrow

Point Barrow

Point Hope

Kotzebue Sound

Kotzebue

Kobuk R.

Selawik L.

Selawik R.

Hotham Inlet

Norton Sound

Port Clarence

Cape Prince of Wales

Cape Blossom

Cape Lisburne

Wainwright Inlet

Wainwright

Icy Cape

Point Belcher

Point Hope

Kowak R.

Noatak R.

Colville R.

Colville Delta

Colville Mouth

Kuparuk R.

Killik R.

Chandler R.

Anaktuvuk Pass

Arctic Mts

Brooks Range

Endicott Mts

Romanzof Mts

Franklin Bluffs

Sagavanirktok R.

Shaviovik R.

Canning R.

Canning River

Mackenzie Bay

Demarcation Point

Herschel Island

Kay Point

Kay Point Bay

Phillips Bay

Simpson Lagoon

Harrison Bay

Cape Halkett

Cape Simpson

Cape Smythe

Cape Lonsdale

Cape Beaufort

Cape Thompson

Cape Krusenstern

Cape Espenberg

Cape Prince of Wales

Diomede Is.

Big Diomede

Little Diomede

Fairway Rock

Gold

Coal

XUM

Scale — 1:3600000 or about 57 miles to one inch

60 50 40 30 20 10 0 60 120 180

NOTE.—Published January, 1898. The base is a copy of a part of chart T of the U. S. Coast and Geodetic Survey, edition of June, 1897.

Birch Creek series
Fortymile series
} Both are gold bearing

Rocky Mountains
YUKON
KLONDIKE REGION
Coal
Gold
Port Reliance (Ruins)
DAWSON
Old Fort Ho.
Stewart River
Beaver R.
Mc Millan River
Mc Millen Mts 3200
Glenlyon Mts
Glenlyon R.
Pelly R.
Orchay R.
Hess R.
Pelly Banks Fort (Abandoned)
Pelly Lake
Mt Pharoah Lake
Finlayson Lake
Mt. Logan 7000
Frances
Campbell Mts 5500
Tootsha Range 7850
Tacomb Mts 3500
Simpson Mts 8500
Lizard River
Mc Pherson R.
Pelly Mountains 5000-7000
Little Salmon R.
N. Fork
Big Salmon R.
Lewes R.
Tummel R.
Tatchun R.
Upper Ramparts
Klotassin
Casslar
Quiet L.
Blue R.
Dease River
5500-6500
Telegraph Gold Trail
Hootalinqua or Teslin R.
Mineral Ridge 4000-4500
Little R.
Mandanhall R.
Rink R.
Klaanta R.
10000-12000
Dalton Trail
Bound Trail
High Mountains
High Range
Attlin L.
Reportage
Easy Portage
British Govt. Trail
Dease Lake Ho.
Hotsalub Mts.
Stikine River
Second South Fork
Telegraph Creek
Stikine Range
Old Telegraph Route
Nasse River
Mt. Natazhat
Scooloi Pass
Mt. Hubbard
Mt. St. Elias 19500
Mt. St Elias 9010
Malaspina Glacier
Yakutat Bay
Ley Bay
Pt. Manby
Ocean Cape
Cape St Elias
Monterey
Monthly Mail Steamers
Ley Strait
Tenakee Inlet
Chichagof
Admiralty
Sitka
Kupreanof
Wrangell
Cape Fanshaw
Coal
Chilkat R.
Chilkoot Pass
Skagway
Dyea
White Pass
Taku R.
Stikine R.
Iskut R.
Unuk R.
Chickamin R.
Behm Canal
Portland Canal
Observatory Inlet
Port Simpson
Naas Harbor
Metlakahtla
Fort Wrangell
Fort Tongass
Cape Chacon
Cape Muzon
Dixon Entrance
Queen Charlotte Islands
Skidegate Inlet
Masset Inlet
Rose Spit
Cape Ommaney
Cape Edward
Cape Decision
Cape Bazan
Cape Ulitka
Cape Addington
Cape Muzon
Cape Chacon
Cape Fanshaw
Cape Pole
Cape Cross
Cape Spencer
Cape Fairweather
Cape Suckling
Cape St Elias
Yakutat Vill.
Chilkat Vill.
Port Wrangell
Port Tongass

C.York
Port Clarence
Pt. Spencer
Mt. Bendeleben
C. Douglas
C. Rodney
Sledge I.
C. Nome
Gold
C. Darby
Norton Bay
Bedborough
Nulato
Wolassaka
Koyukuk R.
Yukon R.
Newchokat R.
Mt. Mc. Kinley
Gold
Kuskokwim R.
Glacier
Western Branch
Stuhlna R.
Mt. Sushitna
5600
64°
N O R T O N S O U N D
St. Michael I.
FORT ST. MICHAEL
MILITARY RESERVATION
Pt. Romanof
Pastol Bay
Shageluk
Koserefski
Holy Cross Mission
Ikogmut
Andreafski
Starikvihpak
Kolmakof
North Foreland
C. Sieperma
C. Kukuliak
C. Chitnak
N.E. Cape
East Cape
Punuk Ids.
S.E. Cape
C. Dyer
C. Smith
Sand Ids.
C. Romanzof
Dall Pt.
Hooper Bay
Kashunuk R.
Askinuk R.
Aigan R.
62°
Kulichavak R.
Odgovigamut
Gavinamut
Oknagamut
Kwim R.
Malchatna R.
Nikhkik
Lake Clark
Redoubt Vol.
Toyeyland
Kaligin I.
Nelson I.
C. Vancouver
Hazen Bay
Tununak
C. Etolin
Koot
Cape Mohican
Nunivak Island
Ingeramute
C. Corwin
Kweeganute
C. Mendenhall
60°
M E R S E A
MONTHLY MAIL STEAMER ROUTE TO ST. MICHAEL
E T O L I N S T R A I T
Kuskokwim Bay
Kwich R.
Tikchik
Tikchik Lake
Kakrok
Kwichak R.
Kaskanakh
Kwichak
Koggiung
Anagbak
Ft. Alexander
Nushagak R.
Wiamna Lake
Augustine I.
Cape Elizabeth
Ushagat I.
Sea Otter Ids.
Four Peaked Mt.
Kaguyak
Segaloaf Peak
Johnstons Hill
C. Douglas
Togiak
Goodnews B.
Togiak Bay
Nushagak R.
Nicholls Hill
C. Newenham
C. Peirce
Hagemeister I.
C. Constantine
C. Menchikof
Igagik
Ugashik
Becharof L.
Kialagvik
Mt. Oliver
Kaya Bluff
Alitak
Low C.
Cape Trinity
BRISTOL BAY

Mt. McKinley
Mt. Hoseuhill
Wolassatna R.
Nowitna R.
Kaiyuh R.
Innoko R.
Yukon Mts
Shageluk
Koserefsk
Holy Cross Mission
Kolmakof
Kuskokwim R.
Gold
Western Branch
Stuchitna R.
Little Stuchitna R.
Mt. Suchitna 5600
Cape Suchitna
Cook Inlet
North Foreland
East Foreland
Kenai
Kalgin I
Redoubt Volcano
Nikhkhk
Lake Clark
Chulitna R.
Malchatna R.
Diamna Peak
Iliamna Lake
Tikchik
Tikchik Lake
Kakwok
Kvichak R.
Koggiung
Sugarloaf Peak
Anagnak
Kvichak
Nushagak R.
Togiak
Nushagak Bay
Ugashik
Ugashik R.
Ugashik Bay
Port Heiden
Cape Menshikof
Mt. Olga
Kialagvik
Kaya Bluff
Aglegok
Becharof L.
Becharof R.
Ugashik Lakes
Agaligak R.
Nuchilla Hill
Johnstons Hill
Kinisak
Nakeek R.
Nakeek L.
Ukak
Ft. Alexander
Cowper
Etolin Pt.
Goodnews B.
Newenham
C. Peirce
Hagemeister I.
Wahoo Twins
Togiak
Togiak R.
Kulichavak R.
Odgovigamut
Gavinamut
Oknagamut
Quinegnaha
Warehouse
Tikchik R.
Nushagak Peninsula
Nushagak Bay
Ugashik Bay
Port Graham
Augustine I.
Cape Elizabeth
Ushugat I.
Amatuli I.
Barren Is.
Kamishak Bay
C. Douglas
Four Peaked Mt.
Kaguyak
Kaguyak Bay
Sea Otter Is.
Pt. Banks
Shuyak I.
Sea Otter
Shuyak Str.
Kinkpalik I.
Chiniak C.
Chiniak B.
Pillar B.
Pillar Pt.
Ugak B.
Ugak I.
Ugak Bay
Marmot I.
St. Hermogenes C.
Sea Lion Rks
Kodiak
Kodiak I.
Spruce I.
Afognak I.
Afognak
Afognak Bay
Shuyak Harbor
Sitkalidak I.
Sitkalidak Str.
Sitkalidak Harbor
Trinity Is.
Low C.
Albatross Bank
Port Bailey
Port Dick
Gore Pt.
Gore Point
Gregats Is.
Dye Is.
Homer
Kachemak Bay
Seldovia
Port Chatham
Chiswell Is.
Seal Rocks
Cape Resurrection
Blying's Sound
Aialik Bay
Aialik Glacier
Pederson Glacier
Bear Glacier
Holgate Glacier
Harris Glacier
Grewingk Glacier
Port William
Sound
Seal Is.
Bainbridge I.
Elrington I.
Evans I.
Perry I.
Knight I.
Montague I.
Wooded Is.
Cape Cleare
Puget
Pt. Pamplona
Pt. Elrington
Pt. Kenai
Kenai
Russian R.
Kasilof R.
Kasilof
Port Graham
Nanwalek
Seldovia
Seldovia Bay
Homer Spit
Kachemak Bay
Fox R.
Port Bailey
Alaganik
Cordova
Copper R.
Chilkat Pass
Chilkat Inlet
Chilkat Village
Lynn Canal
Skagway
Taiya Inlet
Wingham I.
C. Hinchinbrook
C. Martin
C. Puget
Hinchinbrook I.
Kayak I.
Reported Rk.
Sea Otter River
Fountain Rk.
Middleton I.
Cape St. Elias
Mt. Sanford 16000
Mt. Drum 13300
Mt. Tillman 14000
Mt. Wrangell 14500
Mt. Blackburn 16500
Mt. Natazhat
Mt. St. Elias 18010
Mt. Logan 19500
Scolai Pass
Tazlina R.
Klutina R.
Chitina R.
Copper R.
Chitina
Tonsina R.
Chilkadnu R.
Chilkadnu Glacier
Bremner R.
Konsina R.
Mitchell R.
Sheridan Glacier
Sheridan R.
Miles Glacier
Childs Glacier
Eyak
Eyak Lake
Eyak R.
Cordova
Orca Inlet
Orca
Port Fidalgo
Port Bainbridge
Resurrection Bay
Port Chatham
Pt. Pamplona
Pt. Elrington
Pt.

DISTRICT

GULF OF ALASKA

DALTON TRAIL

KLONDIKE TRAIL

CHILKAT TRAIL

WHITE PASS TRAIL

DYEA

SKAGWAY

BRITISH GOVT. TRAIL REPORTED EASY PORTAGE

STRIKINE TRAIL

TELEGRAPH TRAIL

MONTHLY MAIL STEAMER ROUTE FROM SAN FRANCISCO

MONTHLY MAIL STEAMER ROUTE

PORTLOCK BANK

TROSS BANK

Mt. Sanford 16000

Mt. Wrangel 17500

Mt. Drum 14300

Mt. Tillman 12900

Mt. Blackburn 12500

Mt. Natazhat

Mt. St. Elias 18010

Scolai Pass

Malaspina Glacier

Ice Bay

Yakutat Bay

Ocean Cape

Pt. Manby

Yakutat

Pt. Pellew

Port William

Sound Seal Rks

Allegan

Wingham I.

Cape St. Elias

Kayak I.

Reported Rk.

Sea Otter Reef

Montague I.

Wooded Ids.

Cape Cleare

Fountain Rk

Middleton I.

C. Resurrection

Flying Sound

Chiswell Ids.

Seal Rocks

Pye Ids.

Gore Pt.

Dick Bay

Miners Rks.

Little R.

White Horse Rapids

Mendenhall R.

Atlin L.

High Range

Gold

Lake Bennett

Tagish Lake

Marsh Lake

Lewes R.

Yukon R.

Teslin L.

Teslin R.

Nisutlin R.

Hootalinqua R.

Hootalinqua Mts.

Stikine R.

Telegraph Creek

Taku R.

Taku Arm

Taku Inlet

Glacier

Icy Strait

Tenakee Inlet

Cape Spencer

Cross Sound

Cape Edward

Salisbury Sd.

Mt. Edgecumbe (3900)

Sitka

Whale Bay

Red Fish Bay

Cape Ommaney

Chirikof Bay

Baranof I.

Coronation I.

Iphigenia Bay

C. Addington

C. Bartolome

Wolf Rk.

C. St. Augustine

Forrester I.

Kupreanof I.

Wrangell

Duncan Canal

Frederick Sd.

Admiralty I.

Chatham Strait

Peril Strait

Port Snettisham

Port Althorp

Port Houghton

Port Frederick

Port Conclusion

Port Herbert

GULF OF ALASKA

BRITISH COLUMBIA

DALTON TRAIL

BOUND TRAIL

TELEGRAPH TRAIL

REPORTED EASY PORTAGE

BRITISH GOVT. TRAIL

STRIKINE TRAIL

OLD TELEGRAPH ROUTE

MONTHLY MAIL STEAMER ROUTE FROM SAN FRANCISCO

OLD TRAIL FROM SAN FRANCISCO

DIXON ENTRANCE

Mt. St. Elias 18010

Mt. Logan 19500

Mt. Natazhat

Malaspina Glacier

Scooloi Pass

Mendenhall R.

Mineca Mtns 4000-4500

High Range

High Mountains

Hootalinqua or Teslin R.

Little R.

Atlin L.

Hutlah L.

Tagish L.

Marsh L.

Dease L.

Stikine R.

Iskut R.

Telegraph Creek

Glacier R.

Taku Inlet

Juneau

Douglas Island

Sitka

Cape Edgecumbe

Cape Ommaney

Cape Muzon

Dundas Isl.

Prince of Wales Isl.

Cape Knox

Ketchikan

Wrangell

Port Simpson

Hecate Str.

Nass River

Skeena River

Portland Canal

Behm Canal

Revillagigedo Isl.

Admiralty Isl.

Chichagof Isl.

Baranof Isl.

Kupreanof Isl.

Kuiu Isl.

Frederick Sd.

Stephens Passage

Clarence Str.

Chatham Str.

Sumner Str.

Wrangell Narrows

Duncan Canal

Ernest Sound

Tongass Narrows

Port Wrangell

Port Tongass

Port Chester

Port Houghton

Port Althorp

Port Snettisham

Port Conclusion

Port Frederick

Port Armstrong

Port Pybus

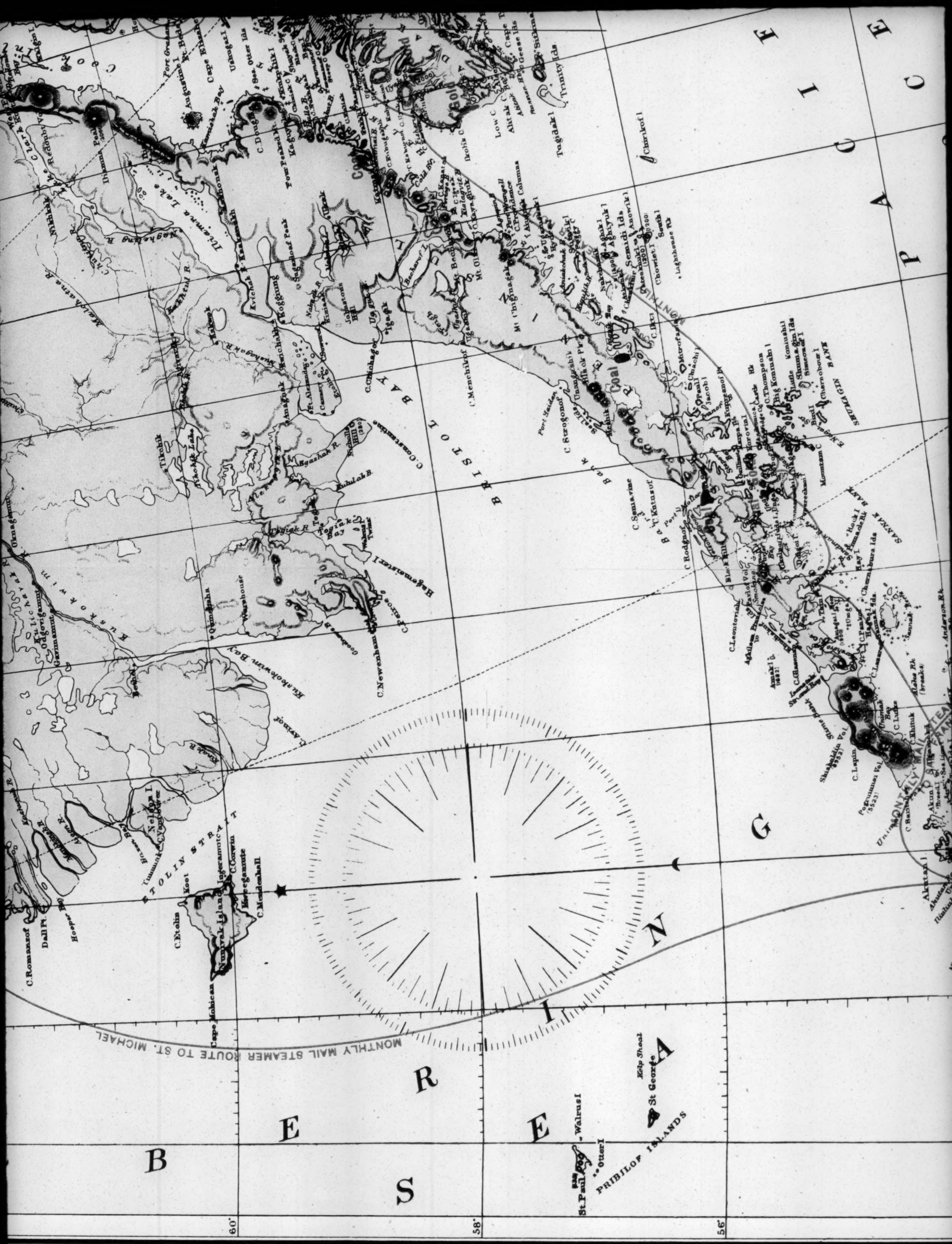
Port Herbert

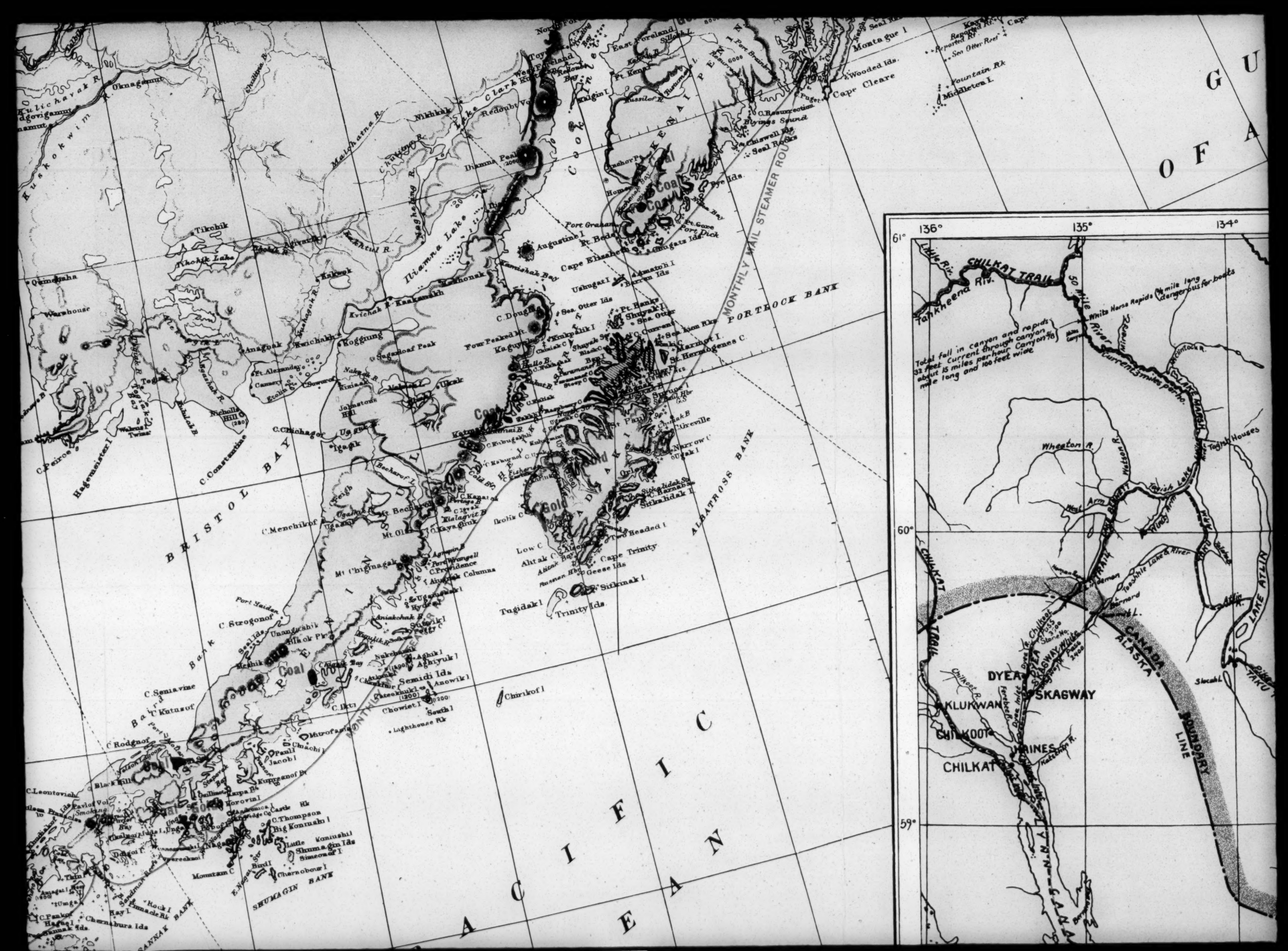
Port Althorp

Port Camden

Port Walter

Port Banks


BERING SEA
PACIFIC OCEAN
BAY
Coal
Gold
Silver
Copper
Tin
Iron
Petroleum
Cinnabar
Graphite
Lignite
Mineral Springs
Hot Springs
Volcano
Lighthouse
Mission
Trading Post
Fish Hatchery
Reindeer Station
Telegraph Station
Meteorological Station
Fur Seal Rookery
Sea Otter
Walrus
Kelp Shoal
MONTHLY MAIL STEAMER ROUTE TO ST. MICHAEL
PRIBILOF ISLANDS
SHUMAGIN BANK
SANAK BANK
TOLIN STRAIT
Nunivak Island
St George
St Paul
60°
58°
56°


BERING SEA
BRISTOL BAY
PACIFIC OCEAN
ALASKA PENINSULA
ALEUTIAN ISLANDS
MONTHLY MAIL STEAMER ROUTE
PORTHOCK BANK
SHUMAGIN BANK
SANNAK BANK
ALBATROSS
Coal
Gold
Kuskokwim R.
Nushagak R.
Togiak R.
Kvichak R.
Naknek R.
Iliamna Lake
Lake Clark
Nushagak Bay
Kvichak Bay
Kamishak Bay
Cook Inlet
Shelikof Str.
Kodiak I.
Afognak I.
Unimak I.
Unalaska I.
Dutch Harbor
Port Moller
Port Heiden
Port Wrangell
Port Clarence
Cape Prince of Wales
Cape Lisburne
Cape Newenham
Cape Constantine
Cape Douglas
Cape Elizabeth
Cape Trinity
Cape Cleare
Cape Resurrection
Cape Greig
Cape Chiniak
Cape Ikolik
Cape Sarichef
Cape Pierce
Cape Stroganof
Cape Rodgnof
Cape Leontovich
Cape Menchikof
Cape Seniavine
Mt. Chiginagak
Mt. Katmai
Mt. Douglas
Mt. Redoubt
Mt. Iliamna
Mt. Olga
Mt. Becharof
Mt. Peak
Mt. Sugarloaf Peak
Mt. Fairweather
Mt. Logan
Mt. St. Elias
Mt. Wrangell
Mt. Blackburn
Mt. Sanford
Mt. Churchill
Mt. Natazhat
Mt. Hayes
Mt. McKinley
Mt. Foraker
Mt. Hunter
Mt. Deception
Mt. Denali
Mt. Kimball
Mt. Vancouver
Mt. Fairweather
Mt. Edgecumbe
Mt. Redoubt
Mt. Iliamna
Mt. Augustine
Mt. Katmai
Mt. Douglas
Mt. Peak
Mt. Olga
Mt. Becharof
Mt. Chiginagak
Mt. Sugarloaf Peak
Mt. Fairweather
Mt. Logan
Mt. St. Elias
Mt. Wrangell
Mt. Blackburn
Mt. Sanford
Mt. Churchill
Mt. Natazhat
Mt. Hayes
Mt. McKinley
Mt. Foraker
Mt. Hunter
Mt. Deception
Mt. Denali
Mt. Kimball
Mt. Vancouver
Mt. Fairweather
Mt. Edgecumbe
Tikchik
Nikchik Lake
Togiak
Goodnews Bay
Kanakanak
Kvichak
Koggiung
Anagnak
Ft. Alexander
Ft. Kenai
Ft. Glenn
Ft. Liscum
Ft. Gibbon
Ft. Egbert
Ft. Yukon
Ft. Hamlin
Ft. Selkirk
Ft. Wrangell
Ft. Simpson
Ft. Rupert
Ft. Langley
Ft. Victoria
Ft. Nisqually
Ft. Vancouver
Ft. Hall
Ft. Laramie
Ft. Leavenworth
Ft. Riley
Ft. Scott
Ft. Gibson
Ft. Smith
Ft. Sill
Ft. Worth
Ft. Davis
Ft. Bliss
Ft. Huachuca
Ft. Apache
Ft. Whipple
Ft. Mojave
Ft. Yuma
Ft. Tejon
Ft. Point
Ft. Mason
Ft. Bragg
Ft. Ross
Ft. Bodega
Ft. Humboldt
Ft. Jones
Ft. Klamath
Ft. Rock
Ft. Harney
Ft. Walla Walla
Ft. Colville
Ft. Spokane
Ft. Sherman
Ft. Missoula
Ft. Shaw
Ft. Custer
Ft. Keogh
Ft. Yates
Ft. Totten
Ft. Abercrombie
Ft. Snelling
Ft. Dodge
Ft. Des Moines
Ft. Madison
Ft. Leavenworth
Ft. Riley
Ft. Scott
Ft. Gibson
Ft. Smith
Ft. Sill
Ft. Worth
Ft. Davis
Ft. Bliss
Ft. Huachuca
Ft. Apache
Ft. Whipple
Ft. Mojave
Ft. Yuma
Ft. Tejon
Ft. Point
Ft. Mason
Ft. Bragg
Ft. Ross
Ft. Bodega
Ft. Humboldt
Ft. Jones
Ft. Klamath
Ft. Rock
Ft. Harney
Ft. Walla Walla
Ft. Colville
Ft. Spokane
Ft. Sherman
Ft. Missoula
Ft. Shaw
Ft. Custer
Ft. Keogh
Ft. Yates
Ft. Totten
Ft. Abercrombie
Ft. Snelling
Ft. Dodge
Ft. Des Moines
Ft. Madison
Nushagak
Togiak
Goodnews Bay
Kanakanak
Kvichak
Koggiung
Anagnak
Ft. Alexander
Ft. Kenai
Ft. Glenn
Ft. Liscum
Ft. Gibbon
Ft. Egbert
Ft. Yukon
Ft. Hamlin
Ft. Selkirk
Ft. Wrangell
Ft. Simpson
Ft. Rupert
Ft. Langley
Ft. Victoria
Ft. Nisqually
Ft. Vancouver
Ft. Hall
Ft. Laramie
Ft. Leavenworth
Ft. Riley
Ft. Scott
Ft. Gibson
Ft. Smith
Ft. Sill
Ft. Worth
Ft. Davis
Ft. Bliss
Ft. Huachuca
Ft. Apache
Ft. Whipple
Ft. Mojave
Ft. Yuma
Ft. Tejon
Ft. Point
Ft. Mason
Ft. Bragg
Ft. Ross
Ft. Bodega
Ft. Humboldt
Ft. Jones
Ft. Klamath
Ft. Rock
Ft. Harney
Ft. Walla Walla
Ft. Colville
Ft. Spokane
Ft. Sherman
Ft. Missoula
Ft. Shaw
Ft. Custer
Ft. Keogh
Ft. Yates
Ft. Totten
Ft. Abercrombie
Ft. Snelling
Ft. Dodge
Ft. Des Moines
Ft. Madison
136°
135°
134°
61°
60°
59°
CHILKAT TRAIL
Little R.
Tahkheena Rs.
50 Mile River
White Horse Rapids ¼ mile long dangerous for boats
Total fall in canyon and rapids 32 feet Current through canyon about 15 miles per hour Canyon ½ mile long and 100 feet wide
Current 3 miles per hr.
McClintock R.
Whiting R.
Whiting R.
Whiting

GULF OF ALASKA

ALBATROSS BANK

PORTLOCK BANK

MONTHLY MAIL STEAMER ROUTE FROM SAN FRANCISCO

Gold

Coal

Cape Cleare

Montague I

Middleton I.

Cape Edward

Cape Ommaney

Coronation I.

Hazy Isls.

Pye Isls.

Marmot I.

St. Hermogenes C.

Sitkalidak I.

Trinity

Narrow C

Seal Rks.

Wooded Isls.

Fuger

Chiswell Is.

Fort Dick

Fort Gore

Port Bramble

Port Wrangell

Sitka

Whale Bay

Redfish Bay

Darrow Bay

Chirikof I.

Kayak I.

Reported Rk.

Sea Otter Reef

Fountain Rk

Mt. Edgecumbe (3,201)

Sokolof Isls.

Cape Spencer

Icy Str.

Lynn Canal

Taku Inlet

Juneau

Douglas I.

Admiralty I.

Chichagof I.

Baranof I.

Kruzof I.

Yakobi I.

Kodiak I.

Afognak I.

Shuyak I.

Sea Otter Rks

Sea Lion Rks

Current

Spruce I

Seal Hbr

Sitkalidak Str.

Sitkalidak I.

Headed I

Uganik I

Uganik B

Uganik Pass

Chiniak B

Kodiak

Ugak I

Ugak B

Karluk B

Karluk

Afognak

Shelikof Str.

Kenai

Kenai Mts

Kenai Pen.

Russian R.

Kasilof R.

Kasilof

Homer

Seldovia

Port Graham

Port Bainbridge

Resurrection Bay

Seward

Kachemak Bay

Kachemak B

Cook Inlet

Kamishak B

Iniskin B

Iniskin Pen.

Iliamna Lake

Iliamna Bay

Iliamna Volcano

Chinitna B

Tuxedni Bay

Tuxedni I

Harris I

Shuyak Str.

Spa Cove

Spa Current

Sea Lion Rks

Marmot I.

St. Hermogenes C.

Pye Isls.

Fort Gore

Fort Dick

Chiswell Is.

Seal Rks.

Wooded Isls.

Cape Cleare

Fuger

Resurrection Bay

Seward

Kayak I.

Reported Rk.

Sea Otter Reef

Fountain Rk

Middleton I.

Montague I

Seal Rks.

Cape Spencer

Icy Str.

Lynn Canal

Taku Inlet

Juneau

Douglas I.

Admiralty I.

Chichagof I.

Baranof I.

Kruzof I.

Yakobi I.

Sitka

Whale Bay

Redfish Bay

Darrow Bay

Chirikof I.

Cape Ommaney

Coronation I.

Hazy Isls.

Mt. Edgecumbe (3,201)

Sokolof Isls.

Cape Edward

Solisbury Sd.

Chatham Str.

Frederick Sd.

Stephens Passage

Port Snettisham

Port Althorp

Port Houghton

Gambier Bay

Glacier Bay

Icy Bay

Yakutat Bay

Yakutat

Disenchantment Bay

Malaspina Glacier

Mt. St. Elias (18,100)

Mt. Fairweather (15,500)

Mt. Crillon (15,900)

Mt. Vancouver (15,700)

Mt. Logan (19,500)

Mt. Wrangell (14,000)

Mt. Blackburn (16,140)

Mt. Sanford (16,208)

Mt. Drum (14,005)

Mt. Jarvis (12,900)

Mt. Hubbard (14,950)

Mt. Cook (13,760)

Mt. Fairweather Range

Chilkat Range

Chilkat Inlet

Chilkat Pass

Chilkoot Pass

Chilkoot Barracks

Dyea Inlet

Dyea Flats

Taiya Inlet

Skagway Bay

Skagway River

Skagway

Dyea

Klukwan

Chilkoot

Haines

Chilkat

Haines Mission

Pyramid Harbor

Chilkat Inlet

Chilkoot R.

Chilkat R.

Klehini R.

Tsirku R.

Kataheen R.

Porcupine

Dyea Inlet

Forebreaker Point

Dyea Flats

Taiya Inlet

Skagway Bay

Skagway River

Skagway

Dyea

Klukwan

Chilkoot

Haines

Chilkat

Haines Mission

Pyramid Harbor

Chilkat Inlet

Chilkoot R.

Chilkat R.

Klehini R.

Tsirku R.

Kataheen R.

Porcupine

Chilkoot Trail

Chilkat Trail

Skagway-White Pass Trail

Dyea-Chilkoot Pass 3,500 Stone No. 1

Skagway-White Pass 2,400

Canada-Alaska Boundary Line

Chilkat Trail

Chilkoot Trail

Skagway-White Pass Trail

Dyea-Chilkoot Pass 3,500 Stone No. 1

Skagway-White Pass 2,400

Canada-Alaska Boundary Line

Lake Bennett

Lindeman

Lake Lindeman

Bennett

Lake Bennett

Carcross

Tagish Houses

Tagish Lake

Tagish

Wheaton R.

Watson R.

Nares R.

Nares Lake

Nares River

Nares Canyon

Whitehorse Lake & River

Whitehorse

Lake Marsh

Lake Arthur

Lake Atlin

Atlin

Atlin R.

Pike River

Taku Trail

Taku Arm

Taku River

Sloko L.

Sloko Inlet

Sloko Lake

Sloko Creek

Sloko Canyon

Sloko Rapids

Sloko River

Sloko Inlet

Sloko Lake

Sloko Creek

Sloko Canyon

Sloko Rapids

Sloko River

Telegraph Route

Teslin Lake

Nisutlin Riv.

Nisutlin Bay

Nisutlin Bay Post Office

Nisutlin Bay

Nisutlin Bay Post Office

Nisutlin Bay

Nisutlin Bay Post Office

GULF OF ALASKA

MONTHLY MAIL STEAMER ROUTE FROM SAN FRANCISCO

DIXON ENTRANCE

KLONDIKE REGION

BOUNDARY LINE

CANADA ALASKA BOUNDARY LINE

TELEGRAPH ROUTE

TESLIN LAKE

LAKE ATLIN

TAKU TRAIL

YUKON

KLONDIKE RIVER

STEWART RIVER

Cape St Elias
Cape Edward
Cape Ommaney
Coronation I.
Cape Addington
Cape Bartolome
Cape Muzon
Dixon Entrance
Dundas Isl.
Pearse Pt.
Cape Knox
Stephens I.
Nass River
Port Simpson
Hecate Str.
Sitka
Whale Bay
Red Fish Bay
Deroch Bay
Chatham Sd.
Hazy Isls.
Ibbigamik Bay
Old Tongass
San Francisco
Wolf Rk.
St. Augustine
Forrester I.
Mt. Edgecumbe
Baranof
Kupreanof
Wrangell
Petersburg
Juneau
Douglas Isl.
Taku Inlet
Taku Glacier
Taku River
Taku Arm
Taku Inlet
Whiting R.
Whiting Arm
Whiting Mtn.
Whiting Glacier
Whiting Lake
Whiting Pass
Whiting Glacier
Whiting Lake & River
Whiting Mtn.

BERING SEA

PACIFIC OCEAN

BRISTOL BAY

ALASKA PENINSULA

MONTHLY MAIL STEAMER ROUTE

SAN FRANCISCO

DAVIDSON LINE

60°
58°
56°
54°
170°
168°
166°
164°
162°
160°
158°
156°

Cape Mohican
Nunivak Island
Jugerannute
C. Corwin
Kweeganute
C. Mendenhall
Warehouse
Kuskokwim Bay
C. Avinof
Qumoonha
Nushegak R.
Kakvok
Nushegak Bay
Goodhope R.
Togiak Bay
Togiak
Igagnak R.
Nicholls Hill (280)
C. Newenham
C. Peirce
Hagemeister I
Walrus Twins
C. Constantine
Anagoak
Kwichak
Ft. Alexander
Canary
Etolin
Sowoud
Kinisak
Nakeek R.
Kvichak R.
Koggiung
Sugarloaf Peak
Johnstons Hill
Alaska L.
Ukiak
C. Chichagof
Igagik
Ugashik
Becharof L.
Ugashik
Mt. Black
Mt. Chiginagak
C. Providence
Aiaktalik Columns
Port Heiden
C. Strogonof
Port Yaider
Unangashik
Black Pt.
Seal Ids.
Bank
Coal
Nukchuk Bay
Aghiyuk I.
Semidi Ids.
Anowik I.
Chowiet I.
South I.
Lighthouse Pk.
C. Semiavine
C. Katmai
C. Rodgnof
Port Wrede
Mitrofania I.
Chirikof I.
Chirikof Rk.
Paul I.
Jacob I.
Kuppanof Pt.
C. Leontovich
Black Hill
Pavlof Vol.
Smoking
Aghileen Pinnacle
Amak I. (682)
Khashakof
C. Glascum
Stone Bank
Shishaldin Vol. (9523)
C. Lapin
Pogromnoi Vol. (3523)
Unimak Bay
C. Lutke
C. Sarichef
C. Khituk
Akutan I.
Akutan Pass
Ilianuk Pt.
Makushin Mt. (5741)
Makushin Bay
Bogoslof I. (644)
Chernofski Harbor
Makerovskoi B.
Kashega
Unalaska I.
Umnak I.
Fisher Pass
Biorka I.
Akun I.
Breed I.
Sea Lion I.
Tigalda I. (1207)
Avatanak I.
Kelp Shoal
St George
St Paul
Walrus I.
Otter I.
PRIBILOF ISLANDS
Tolstoi
Ugamok
Ugamok Bay
Mt. Ogamok
Mt. Bochinski
Kialagvik B.
Kayagunak
Ugashik L.
Ugashik R.
Aniakchak B.
Aniakchak R.
Aniakchak Columns
Port Wrangell
Ugashik Hydro
Ugashik I.
Aghiyuk I.
Nukchuk Bay
Semidi Ids.
Anowik I.
Chowiet I.
South I.
Lighthouse Pk.
Chirikof I.
Chirikof Rk.
Mitrofania I.
Paul I.
Jacob I.
Kuppanof Pt.
Chachi I.
Port Moller
Stepovak Bay
Herring Bay
Herring Rk.
Korovin I.
Castle Rk.
C. Thompson
Big Koniushi I.
Little Koniushi
Shumagin Ids.
Simeonof I.
Chernobour I.
Mountain C.
Sandman Reef
Rock I.
Pinnacle Rk.
Hay I.
Chernabura Ids.
SHUMAGIN BANK
SANNAK BANK
Sannak Rocks
Unimak Pass
Aleska Rk. (breaks)
Anderson Rk. (P.D.)
Leonard Rk. (P.D.)
Kashega Bay
Unalaska Bay
Dutch Harbor
Iliuliuk Bay
Iliuliuk
Amaknak I.
Captains Bay
Ounalashka
Ounalashka Pass
Priboloff Rks.
Kaluga Pt.
Kaluga Bay
Kaluga Head
Kaluga Rk.
Kaluga Spit
Kaluga Lagoon
Kaluga Beach
Kaluga Point
Kaluga Rock
Kaluga Island
Kaluga Channel
Kaluga Harbor
Kaluga Village
Kaluga Church
Kaluga School
Kaluga Store
Kaluga Post Office
Kaluga Telegraph
Kaluga Cable
Kaluga Wireless
Kaluga Lighthouse
Kaluga Fog Signal
Kaluga Buoy
Kaluga Beacon
Kaluga Range
Kaluga Front Light
Kaluga Rear Light
Kaluga Leading Lights
Kaluga Channel Lights
Kaluga Harbor Lights
Kaluga Village Lights
Kaluga Church Lights
Kaluga School Lights
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Kaluga Buoy Lights
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Kaluga Rear Light Lights
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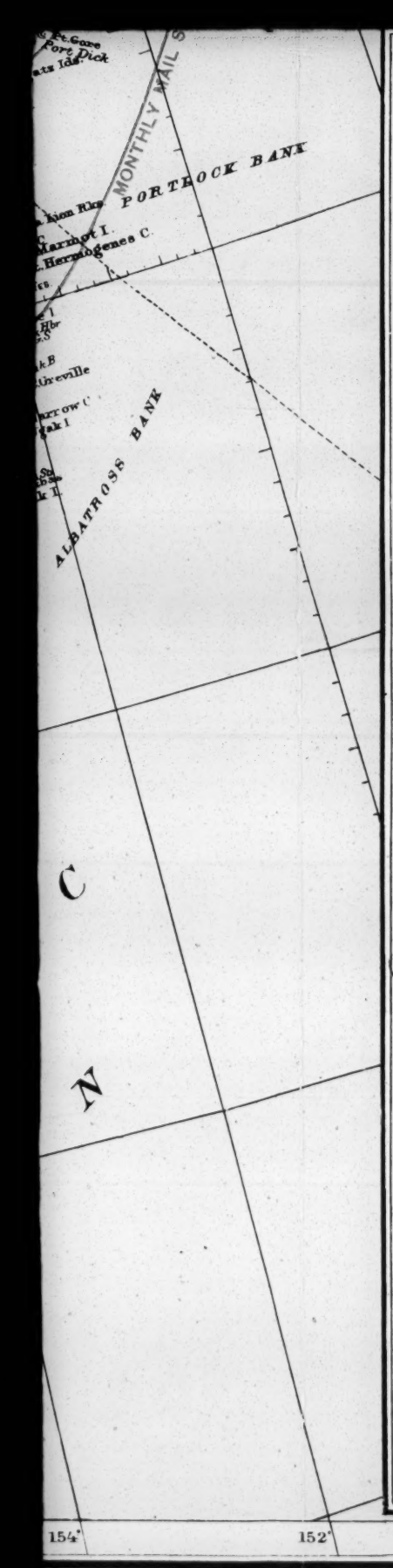
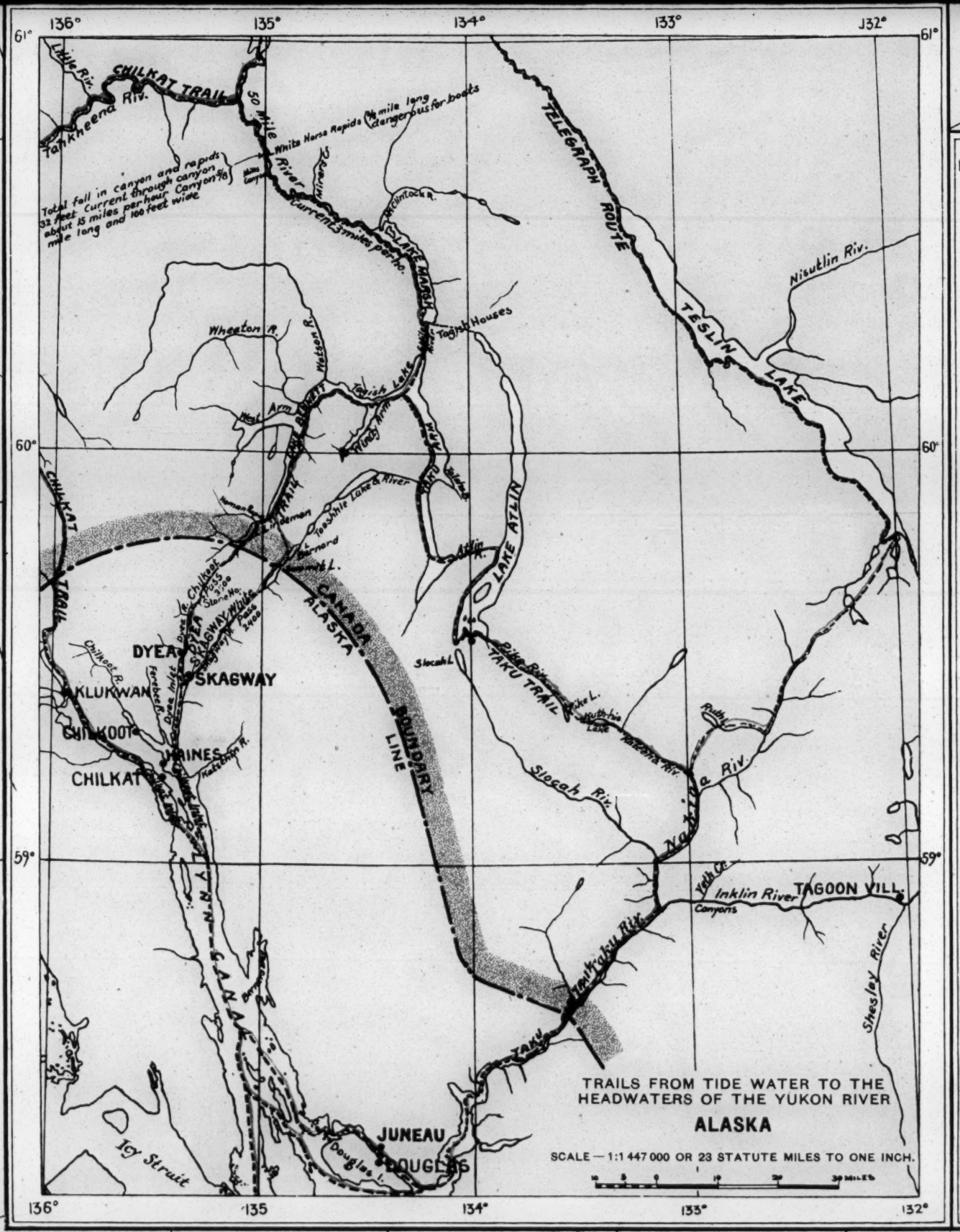
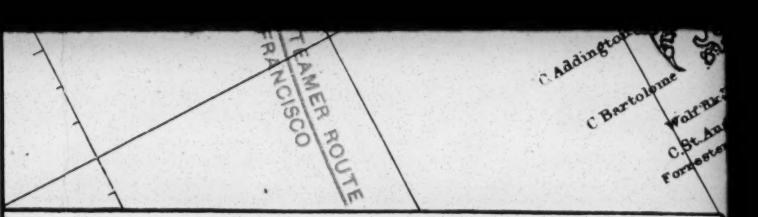
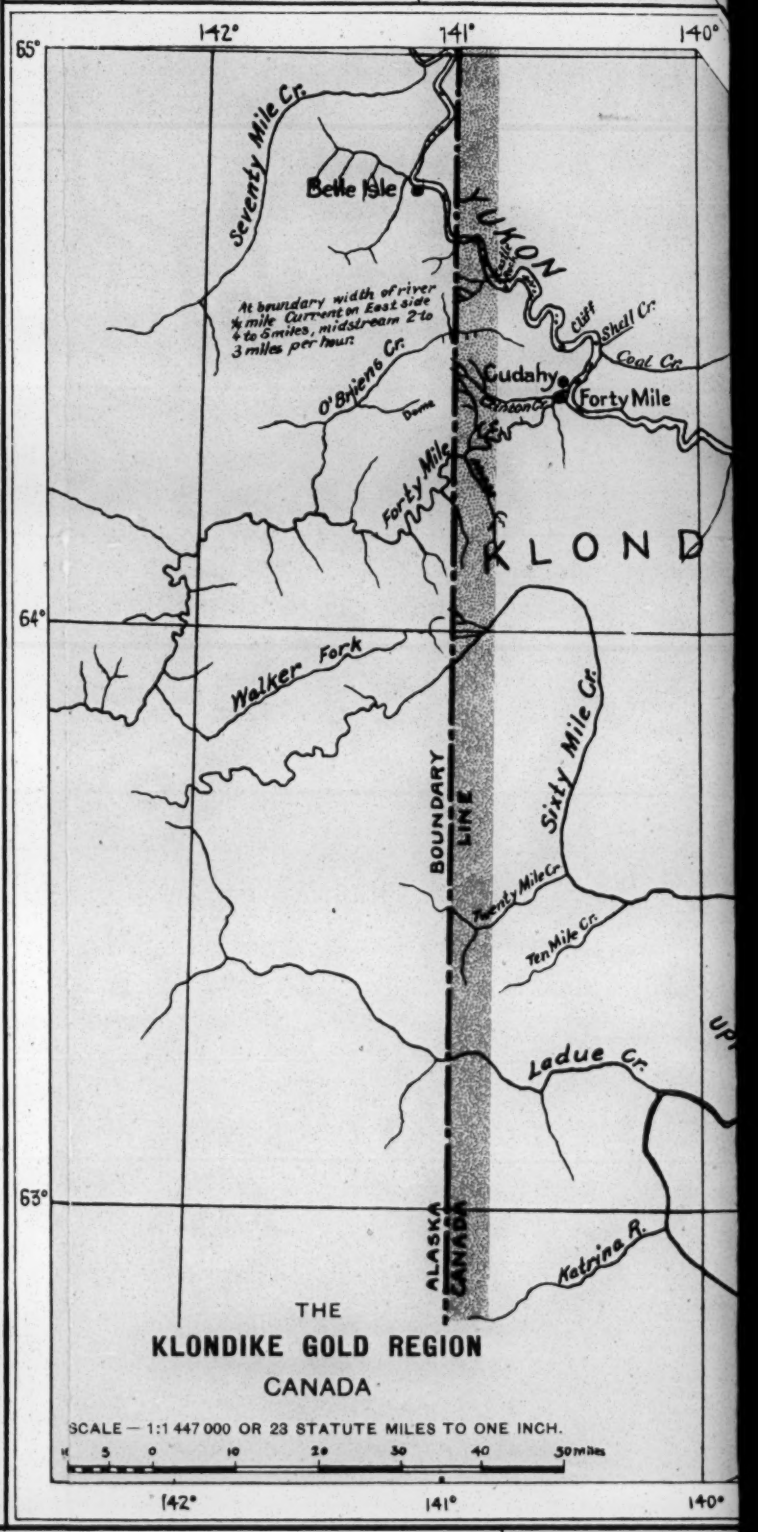
Kaluga Buoy Lights Lights Lights Lights Lights
Kaluga Beacon Lights Lights Lights Lights Lights
Kaluga Range Lights Lights Lights Lights Lights
Kaluga Front Light Lights Lights Lights Lights Lights
Kaluga Rear Light Lights Lights Lights Lights Lights

BRISTOL BAY
PACIFIC OCEAN
BERING SEA
ALBATROSS BANK
PORTLOCK BANK
SHUMAGIN BANK
SANNAK BANK
MONTHLY MAIL S
Coal
Gold
Tikchik Lake
Tikchik R.
Ahtuli R.
Miamna Lake
Quinegnaha
Warehouse
Kakwak
Kaskanakh
Kvichak R.
Anagnak
Kvichak
Koggiung
Segashloaf Peak
Ft. Alexander
Nakeen R.
Kiniak
Johnstons Hill
Nushagak R.
Nushagak Bay
Goodnews B.
Ekwok
Nicholls Hill (280)
Wakeus Twins
Hagemeister I.
C. Peirce
C. Constantine
C. Chichagof
Igagik
Becharof L.
Ugashik
Mt. Chiginagak
Port Heiden
C. Strogonof
Unangashik
Meshik
Seal Ids.
Black Pt.
Nukshagak
Aghik I.
Aghiyuk I.
Semidi Ids
Anowik
C. Semiavine
C. Katusof
C. Ikty
C. Rodgnof
Chowiet I.
South I.
Lighthouse Rk
Chirikof I.
Tugidak I.
Trinity Ids.
Sitkinak I.
Cape Trinity
Geese Ids
Alitak Bay
Low C.
Augustine I.
Cape Elizabeth
Chugats Ids.
Amatuli I.
Barren Ids
Ushagat I.
Sea Otter Ids
C. Douglas
Pt. Banks
Shuyak I.
Four Peaked Mt.
Kaguyak
Kinkpalik I.
C. Current
Sea Otter
Shuyak Str.
Marmot I.
St. Hermogenes C.
Spruce I.
Pauls Hbr.
C. Ureville
Narrow C.
Ugak I.
Sitkalidak I.
Sitkalidak Str.
Barnabas
Orlof
Kaluyak
Kaguyak
Kodiak I.
Kodiak
Afognak I.
Shelikof Str.
Kamishak B.
Kukak B.
Douglas R.
Katmai
Mageik
Mt. Martin
Mt. Katmai
Mt. Mageik
Mt. Denison
Mt. Douglas
Mt. Kaguyak
Mt. Ukinrek
Mt. Peulik
Mt. Chiginagak
Mt. Veniaminof
Mt. Chichaldon
Mt. Isanotski
Mt. Shishaldin
Mt. Pogromni
Mt. Dutton
Mt. Roundtop
Mt. Frosty


MONTHLY MAIL S
PORTROCK BANK
ALBATROSS BANK
C
N


136°
135°
134°
133°
132°
61°
60°
59°
LITTLE Riv.
CHILKAT TRAIL
Tahkheena Riv.
50 Mile River
Current 3 miles per hr.
White Horse Rapids ¼ mile long dangerous for boats
Total fall in canyon and rapids 32 feet Current through canyon about 15 miles per hour Canyon ¾ mile long and 100 feet wide
McClintock R.
CLARE LAKE
Wheaton R.
Watson R.
Tagish Lake
Tagish Houses
West Arm
Windy Arm
TELEGRAPH ROUTE
TESLIN LAKE
Nisutlin Riv.
CHILKAT
Teeshin Lakes River
Atlin R.
LAKE ATLIN
Pike River
TAKU TRAIL
Slocah L.
Mud L.
Chilkoot R.
DYEA
SKAGWAY
KLUKWAN
CHILKOOT
HAINES
CHILKAT
Katzehin R.
CANADA
ALASKA
BOUNDARY LINE
Slocah Riv.
Nahtina Riv.
Inklin River
TAGOON VILL.
Canyons
Shesley River
Tahltan Riv.
TAKU
JUNEAU
DOUGLAS
Icy Strait
TRAILS FROM TIDE WATER TO THE HEADWATERS OF THE YUKON RIVER
ALASKA
SCALE — 1:1 447 000 OR 23 STATUTE MILES TO ONE INCH.


STEAMER ROUTE
SAN FRANCISCO
C. Addington
C. Bartolome
C. St. An


142°
141°
140°
65°
64°
63°
Seventy Mile Cr.
Belle Isle
YUKON
At boundary width of river ¼ mile Current on East side 4 to 5 miles, midstream 2 to 3 miles per hour
Cliff
Shell Cr.
Coal Cr.
O'Briens Cr.
Dawson
Forty Mile
Forty Mile
KLOND
Walker Fork
Sixty Mile Cr.
BOUNDARY LINE
Twenty Mile Cr.
Ten Mile Cr.
Ladue Cr.
ALASKA
CANADA
Katrina R.
THE
KLONDIKE GOLD REGION
CANADA
SCALE — 1:1 447 000 OR 23 STATUTE MILES TO ONE INCH.

TRAILS FROM TIDE WATER TO THE HEADWATERS OF THE YUKON RIVER

ALASKA

SCALE — 1:1 447 000 OR 23 STATUTE MILES TO ONE INCH.

THE

KLONDIKE GOLD REGION

CANADA

SCALE — 1:1 447 000 OR 23 STATUTE MILES TO ONE INCH.

THE

National Geographic Magazine

VOL. IX APRIL, 1898 No. 4

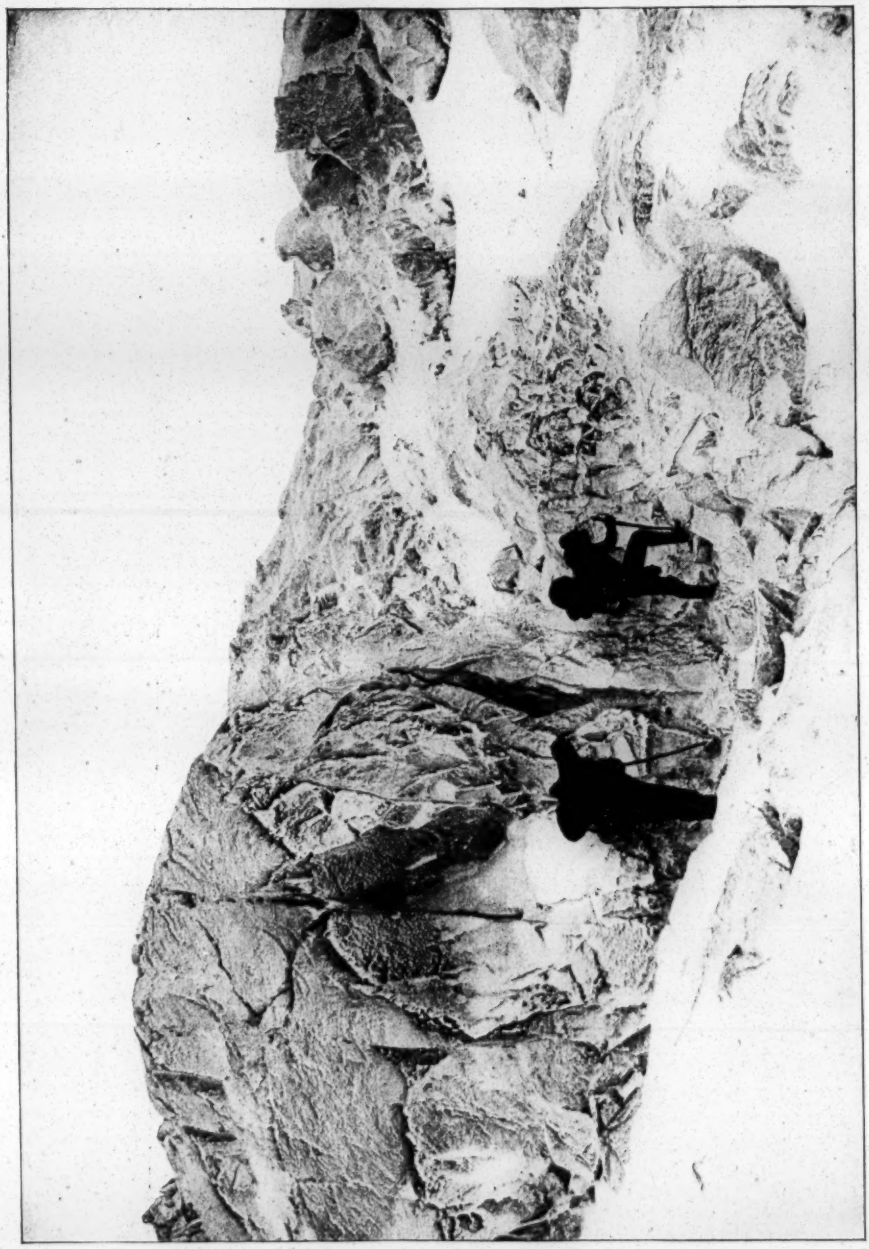
THE NORTHWEST PASSES TO THE YUKON

By ELIZA RUHAMAH SCIDMORE

While Vancouver's ships lay at anchor in July, 1794, in his Port Frederick, the Komtokton of the natives and the Hoonah post-office of today, at the northwest end of Chichagof island, Messrs Whidby and Lemesurier, in a small boat, followed the north shore of Icy straits and penetrated the long Lynn canal, bringing back reports that ended Vancouver's hope and search for a northwest passage through from the Atlantic—De Fuca's straits and Del Fonte's river myths and dreams of "hypothetical projectors" and "closet navigators," as this greatest of surveyors and explorers bitterly termed them.

Whidby's men rowed up that finest fiord of all that landscape coast to Point Seduction, so named because of the "exceedingly artful character" of the natives, who met them at that point and lured them further on up the western arm (Chilkat inlet) to the mouth of the river, just beyond the modern Pyramid Harbor.

These artful natives had then enjoyed trade with white men, and the Chilkats and Chilkoots, really one tribe and closely related, were not only the greatest warriors and boldest buccaneers of the coast, but were great "grease-traders" and middlemen as well. Two "grease trails" led away from the two inlets across the range to the game country beyond, where the milder plains people, the "Stick" or Tinneh tribes of Athabascan stock, were content to trap and trade at great disadvantage, exchanging their pelts and horns for the fish oil and sea products of the coast tribes and the goods which the latter obtained from white traders. Russian, 'Boston,' and Hudson's Bay Company traders realized



CHILKOOT PASS — YUKONERS APPROACHING SUMMIT, OCTOBER, 1897

From a Photograph by E. S. Curtis

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more than one hundred per cent profit on the goods they gave the Chilkats in exchange for furs, and the Chilkats realized a still greater profit when they dealt with the Tinnehs.

For the half century that the H. B. Co.'s ships regularly visited Chilkat inlet the traders never dealt directly with the Tinnehs. The Chilkats were relentless monopolists, meeting the Tinnehs at established camping grounds, at Tagish houses, and other points beyond the range each year, and packing the furs back over the Chilkat or the Shaseki (Chilkoot) pass. Occasionally they brought a Tinneh chief down under escort as a great reward and honor, to allow him to look at the fire-ship of the white traders. Mr Robert Campbell, of the H. B. Co., who crossed from the Mackenzie river to the Pelly in 1842–'43, wrote: "The rascally Chilkat Indians from the Pacific coast were in the habit of making trading excursions to Pelly. They ascended by Lynn canal, thence crossed over the mountains to the head of Lewes river. Descending this river they came to the Pelly, where oftentimes, when strong enough, they pillaged and massacred the Pelly Indians, than whom there could be no more honest men."

In 1849 the H. B. Co. built Fort Selkirk, at the junction of the Lewes river and the Pelly, buying furs directly from the Tinnehs and sending them out by the chain of H. B. Co. forts connecting with the Mackenzie river and Hudson bay. The difficulty of getting supplies into Fort Selkirk had induced the H. B. Co. to consider abandoning it, when the Chilkat chief, incensed at this interference with his fur trade, led a war party across the mountains and plundered and burned the fort. The blockade of the passes was more strictly maintained than ever against Tinnehs and whites.

The first white man to cross the range, according to local Chilkat and common Alaskan tradition, is said to have been a red-headed Scotchman in the employ of the H. B. Co., who, reaching the ruins of Fort Selkirk in 1864, started alone over the old "grease-trail" to the sea. He hid from Indians all the way, but was captured near the coast and held until ransomed by Capt. Swanson, of the H. B. Co.'s *Labouchere*, on its regular visit to Pyramid Harbor. Because of his red hair he was regarded as a shaman and treated with distinction during his stay. Dr Dawson discredits this story of the Scotch pioneer, as Fort Selkirk was in ruins at that time, and he believes the whole story arose from the fact that certain articles belonging to the traders at Fort Selkirk were brought to the trading ship on the coast.

Prof. George C. Davidson, who had visited the Chilkat country in 1867, when making a scientific reconnaissance of Russian America for Secretary Seward, returned in 1869 to observe the eclipse of the sun, August 7, establishing his station and observatory at the upper Chilkat village, where he was the guest of the great chief Chartrich, Kloh-Kutz, or Hole-in-the-Cheek, as that head of the Cinnamon Bear clan was variously known. Secretary Seward and his party were escorted up the Chilkat river in Kloh-Kutz's war canoe on eclipse day, and, joining Prof. Davidson for another day, carried away the astronomer and his instruments before there was time for him to make an intended trip toward the pass. During his stay Prof. Davidson had induced Kloh-Kutz and his wife to draw a very intelligible map of the route up the river to the Chilkat pass and across to Fort Selkirk, a route Kloh-Kutz had traversed since childhood, and which his father had traversed as one of the war party which burned Fort Selkirk. Lying face downward, the old chief and his wife discussed and laboriously drew on the back of an old chart the lines of all the water-courses and lakes, with the profile of the mountains as they appear on either hand from the trail. The great glacier is indicated by snow-shoe tracks to show the mode of progress, and the limit of each of the fourteen days' journey across to Fort Selkirk is marked by cross-lines on this original Chilkat map, which is still in the possession of Prof. Davidson, at San Francisco. There is a copy (Topographical Sheet No. 2268) at the U. S. Coast and Geodetic Survey office at Washington, and this Kloh-Kutz map was the basis of the first charts.

George Holt, a miner, claimed to have crossed the eastern, the Chilkoot, or Shaseki pass in 1872, and descending as far as Lake Marsh, returned by way of the Teslin to the headwaters of the Stikine, following in reverse a part of the route of Michael Byrnes, of the W. U. T. Co. survey, who came up from the Stikine region to the Teslin and Tagish lake in 1867. Holt crossed the pass again in 1874, and descended the Yukon to the portage connecting with the Kuskokwim.

In 1877 Lieut. C. E. S. Wood, U. S. A., undertook independent explorations in Alaska. Mutiny of his canoemen prevented his reaching Mt St Elias, which he wished to climb, but he visited Taylor and Glacier bays on Cross sound, camped and hunted mountain goats around Geikie and Muir inlets, and crossed from the Muir glacier to Lynn canal. He spent some time with the Chilkats and Chilkoots, but neither Kloh-Kutz nor Doniwak,

SKAGWAY CAÑON — YUKONERS EN ROUTE, MARCH 3, 1898

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From a Photograph by E. S. Curtis

the one-eyed tyrant of the Chilkoot village, would let him cross the mountains, which they pictured as full of dangers, although Lieut. Wood was fortified with messages, gifts, and tokens from Doniwak's sister, the wife of Sitka Jack. An account of his stay, "Among the Thlinkets in Alaska," was published in *The Century* magazine July, 1882.

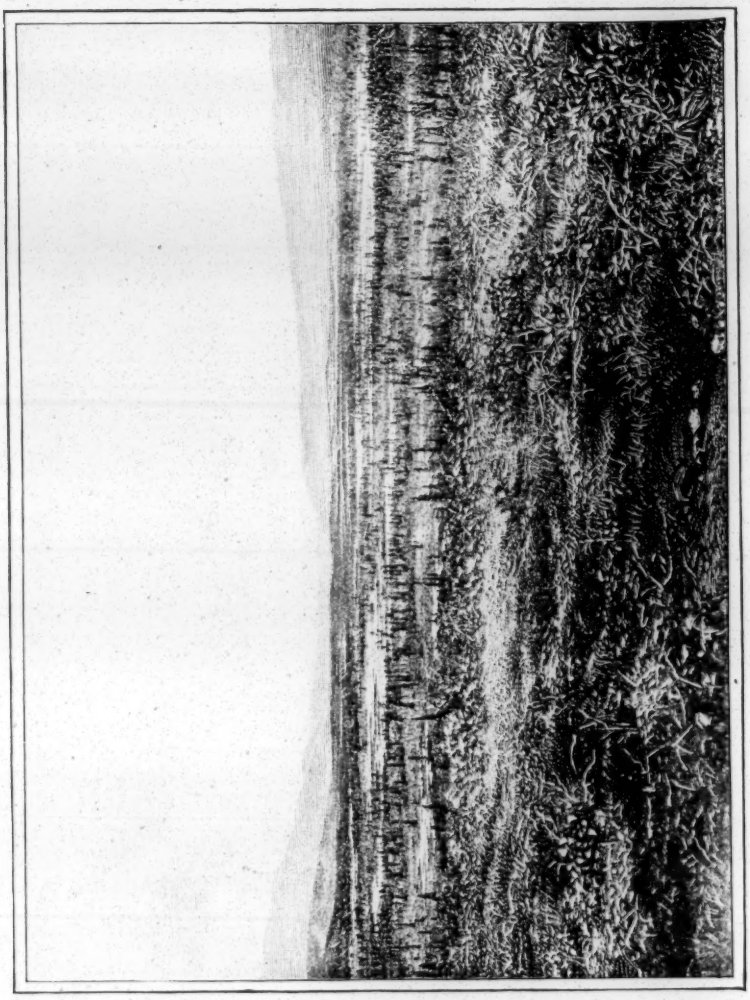
In 1878 Doniwak peremptorily refused entrance to the prospectors Rath and Bean, but is said to have permitted George Holt to go as far as Fort Selkirk and return under guard.

In 1880 the same Edmund Bean, with a party of nineteen miners, were placed under the special protection of Kloh-Kutz, through the active interest and clever diplomacy of Capt. L. A. Beardslee, U. S. N., and guided across the passes, after giving assurances that they would not interfere with the fur trade. A trader did slip in in the wake of the prospectors, but being detected, was brought back and his life saved by Capt. Beardslee's earnest interference. As these miners went in, they met James Wynn (now of Juneau) coming out, and from him received warning of the dangerous rapids in the river beyond the lakes. Wynn has assured me that he had previously crossed the pass in 1879.

Forty-five miners crossed the pass in the spring of 1882 and returned in the autumn, and the Indians, finding that the packing of miners' supplies was more remunerative than the diminishing fur-trade, virtually raised the blockade and established an exorbitant tariff for transportation.

The Doctors Krause, of the Geographical Societies of Berlin and Bremen, spent the year 1882 and the succeeding winter at Pyramid Harbor and in the Chilkat villages, making the ethnographic studies published in the volume *Die Thlinket Indianer* and in collecting for their museum. Kloh-Kutz was, as usual, the patron and protector of scientists, and assisted in their exploration and survey of the Chilkat river and its branches, the Chilkat pass, and the country beyond as far as the great lake named Lake Arkell in 1890. The Drs Krause's maps of this region were published by the Berlin and Bremen Geographical Societies in 1883.

In 1883 Lieut. Frederick Schwatka, U. S. A., crossed by the miners' usual trail the eastern, Chilkoot, or Shaseki pass, renamed it the Perrier pass, and rafted his way down the Yukon to the sea. The miners who went in in 1883 sent back for provisions and spent the winter on the upper Yukon.



VIEW FROM DALTON TRAIL, BETWEEN DALTON'S POST AND HOOTCHI LAKE

By courtesy of McClure's Magazine

In 1884 Dr Everette, U. S. A., crossed the Chilkat pass along the Krause route, intending to explore westward and descend the Copper river, coöperating with Lieut. Abercrombie, who attempted the exploration of Copper river from its mouth; but neither plan was followed to completion. When Lieut. H. T. Allen explored the Copper river in 1885, his party ascended to the headwaters, crossed the divide to the Tanana, and descended that stream to the Yukon.

In 1890 Mr E. J. Glave, leading an expedition sent out by the *Frank Leslie's Weekly* newspaper, followed the Doctors Krause's routeto the Alsek basin, went northward and returning descended the Alsek to the ocean at Dry bay. In 1891 Mr Glave proved his claim that pack horses could be taken over the range and could find sufficient pasturage in the bush country beyond. His "Pioneer Pack-horses in Alaska," published in *The Century* magazine, September and October, 1892, describes his route across to Lake Arkell, a route now known as the Dalton trail—Jack Dalton having been his assistant in the experiment with pack-horses.

The existence of a lower pass still further east, to be reached by an easy trail from Skagway creek, was reported to Mr William Ogilvie during his survey of 1887, and Capt. Moore of his party was detailed to explore it. He determined the altitude of the pass as 2,400 feet above sea-level, and named it in honor of Hon. Thomas White, Canadian Minister of the Interior. It was at once seen that White pass most easily allowed a wagon road to be constructed across to Lake Bennett—a distance of 47 miles and a rise of 2,400 feet, in contrast to the distance of 27 miles and a rise of 3,500 feet on the Chilkoot, Shaseki, or Perrier pass, again named as the Dyea pass by Mr Ogilvie.

The passes to the Yukon basin from Taku inlet and river were known to H. B. Co. traders and the W. U. T. Co. surveyors, but were first definitely exploited as a route to the Yukon mining regions by the expedition of Lieut. Schwatka, U. S. A., and Dr C. Willard Hayes, of the U. S. Geological Survey, in 1891. They followed the north fork of the Taku river and crossed to Lake Teslin, where they launched canvas boats and proceeded without interruption to Fort Selkirk. The river connecting Lake Teslin with the Lewes—known to the Indians as Teslintoo, and as the Hootalinqua or "Hoody-Link" to the miners—was marked on the Coast Survey chart at the time as the Nas-a-thane, or "no salmon," and was renamed the Newberry river by Lieut. Schwatka.

OVERLAND ROUTES TO THE KLONDIKE

By Hamlin Garland

By all accounts the Yukon valley is a grim country—a country of extremes. In winter the sun hardly makes itself felt, rising pale and white only for a few hours above the horizon, while in summer it shines all day and, as an Irishman might say, "part of the night." Moss covers the high ground like a thick wet sponge throughout vast areas, and the soil is in effect perpetually frozen. There is little vegetable mould and plant life is sparse. Steam arises under the hot sun from the cold rain-soaked moss, and the nights are foggy and damp even in June and July. Gnats and mosquitoes move to and fro in dense clouds during midsummer, and add to the many discomforts and discouragements of the region. Life is a warfare. Fuel is scarce. There is little game, and not many fish. There never were many Indians in the district—the valley is too inhospitable for life of any kind to greatly abound. Agriculture is practically impossible. It is likely to freeze any night of the year. The climate, in short, is subarctic in character, and in and about Dawson City nearly all the features of the Arctic zone are realized. The ice does not go out of the river, even at Dawson, till late in May or June, and the river closes early in September.

Having decided that he wishes to take the risk involved in entering this grim country, the miner must decide on his route. The routes may be divided into two groups—the overland and the seaport. Of the overland, there are at present three—the Edmonton and Peace River route, the "Old Telegraph Trail," and the Kamloops inland route. The Edmonton route begins at Edmonton, a small town at the end of a northern spur of the Canadian Pacific Railway, and proceeds by way of Little Slave lake to Peace river, thence across the divide into the valley of the Stikine river to Telegraph creek and Teslin lake, which is the headwaters of the Yukon. This route is a very long one, and little information is obtainable concerning it. It is undoubtedly practicable, and will be largely traveled by those not in breathless haste to get to Dawson City. It offers abundant fields for prospecting and is a pleasant summer route. It will take about

VIEW FROM NEAR DAWSON CITY, LOOKING ACROSS THE YUKON VALLEY

By courtesy of McClure's Magazine

sixty days to go from Edmonton to Teslin lake. The citizens of Edmonton are using all means to make this route easy and safe. It cannot be safely used before the middle of May. Pack horses are plentiful, and feed is good from May 15 to November.

The second overland route, the "Old Telegraph Trail," begins at Ashcroft, a small village on the Canadian Pacific Railway, and follows the Fraser river over an excellent stage road constructed by the Canadian government to the little town of Quesnelle, 223 miles north. Good stopping-places abound along the road. Here the road ends, and the trail turns to the west, and, passing over a nearly level country with good grass, reaches Fort Fraser, on Fraser lake, 125 miles from Quesnelle. Fort Fraser is a Hudson Bay post and trading store, with two white men and several families of Indians, quite well civilized, settled near. A limited amount of supplies will be obtainable here. Up to this point the trail is quite level, and though there are hundreds of creeks none are deep or hard to pass. The three rivers, the Blackwater, the Mud, and the Nechaco, can be forded except in high water, when rafts will have to be used and poled or paddled across. Neither of them is very wide. Many trails cross the route, and it will be necessary to have a native guide, unless some means should be taken to mark the main trail. In this 125 miles there are over 300 good hay swamps and many Indian villages where feed for the horses can be found in abundance.

Beyond Fort Fraser the next supply point is Stuart, a Hudson Bay post, with three or four whites and eighty or one hundred Indians, who live in cabins and make their living by hunting, fishing, and trapping. From Fort Fraser to Hazelton is probably 325 miles. The trip from Quesnelle to Hazelton can be made by pack animals, and will require from sixteen to twenty days. Hazelton has a small population of prospectors who winter in the neighborhood. A Hudson Bay post, a few cabins, and a couple of stores are all that are to be found here, although about 15,000 Indians trade at this point. The goods are brought up by a Hudson Bay boat on the Skeena river during high water.

"From here it is about 200 miles to Telegraph creek. The trail has been traveled for thirty-five years, and the government has spent thousands of dollars to keep it in first-class condition. It will probably take about ten days to cover this distance, as it is a little harder than before reaching Hazelton." There are two large stores at Telegraph creek at present, and undoubtedly a small town will immediately spring up there. From Telegraph

creek over to Teslin lake the trail will be opened and operated by the Canadian government. A wagon road will be constructed and a bill has already passed the House of Commons granting subsidies for a railway. The road at present is estimated to be about 150 miles long and can be traversed in ten days or less. The way is wooded and has no dangerous features. At Teslin lake is a saw-mill and lumber for rafts or boats can be purchased and the rest of the journey made by water.

The Ashcroft trail and the Kamloops route, which is practically the same in character, is alluring. It begins in a genial climate between the coast range and a spur of the Rocky mountains, and is therefore somewhat like eastern Washington in temperature and rainfall. After leaving Quesnelle the trail plunges at once into the wild country, and to those who are fond of sport and adventure it will offer a special charm. There are frequent stopping-places, and the Indians are friendly and if properly treated will be a source of aid in case of necessity.

The advantages of this route are offset, however, by obvious disadvantages. It is very long. According to the most liberal estimates, it will take forty days from Quesnelle to Telegraph creek, though it can probably be done in less time, provided there are no delays for bridge-building. It will be possible to go in light, sending part of the outfit by way of Victoria to Telegraph creek, and by leaving an advance order for supplies with the Hudson's Bay Company to be delivered on a certain date from their stores at Hazelton.

It will not do to leave Quesnelle until the grass comes, say by the 10th of May. Before that time, even though it might afford a fairly good "nip," it would still be watery and without sufficient nutriment. After the 10th of May the Ashcroft trail will be a comparatively cheap and easy route to the Cassiar and Teslin Lake mines, with no duties and very little toll to pay.

In the matter of outfitting it is probable that Kamloops, Ashcroft, and Quesnelle will be able to furnish complete outfits for a limited number of pack-trains, and being upon the Canadian Pacific Railway, supplies in case of need could be hurried forward by telegraph from Victoria, Vancouver, or Winnipeg.

It is safe to count on about fifty days' time from Ashcroft, and while the expense will be light, probably not exceeding three hundred dollars for transportation and a year's provisions, it would not be well to start with less than five hundred dollars in hand or within reach at Teslin lake.

THE FUTURE OF THE YUKON GOLDFIELDS

By WILLIAM H. DALL,

Smithsonian Institution

The conditions likely to prevail in the near future at the Yukon goldfields have received but little attention in the public prints. Some discussion of them may, therefore, be useful.

It is well understood among those who have had experience in that region that the most important question for the welfare of gold-seekers and others visiting the Yukon is that of transportation. Men and, to some extent, domestic animals may reach the Yukon by their own efforts; but their food, tools, tents or other portable shelter, and the heavy clothing necessary for protection against exceptional conditions of temperature and weather must be carried. No man can carry his own provisions and outfit without assistance. Even for dogs, the most economical draught animals, the necessary food will take up an exorbitant proportion of their load. It is hopeless to attempt to transport the necessaries of life for thousands of people by the means hitherto in use.

A conservative estimate places the number of people at present on the Yukon at 5,000. Few have estimated the number desirous of going in during the present season as low as 50,000. Should anything like that number succeed in reaching the Yukon during the next six months, it means that the transportation over that of the past season must be increased tenfold. A certain proportion must be allowed for waste, losses in transportation before reaching the destination, and the excess of need beyond the ordinary ration in more temperate climes.

The number of trips to Dawson, from the seacoast, made in 1897 by the steamers now on the river was seven in all. While, with all conditions favorable, two trips per season can be made by a capable vessel, it is unsafe to reckon on more than one. For 50,000 people seventy trips would have to be made in order to eliminate the possibility of starvation which has stared so many in the face under present conditions. This provides not for comforts, not for necessary furniture, tools, and machinery adequate to improve conditions as they exist, but merely to pre-

vent things from getting worse. Does any reasonable person familiar with the region believe that seventy trips are possible?

Quite a number of flat-bottomed stern-wheelers for the Yukon are believed to be in process of construction at Unalaska, the intention being to tow them to St Michael on the opening of navigation. Suppose that the fleet succeeds in reaching that port by the 27th of June, the average date when the ice goes out of Norton sound. Allow a week for getting them loaded in working order and ready to start for the river with a few days' fuel on board. If they take much fuel they cannot take goods. Once well within the delta, feeling their way cautiously over the sand bars of the river, unknown to most of their navigators, they must depend for fuel on wood cut from the banks. The wood of the country is spruce, with a little poplar and willow. These will not burn when green. When the river ice breaks up, about June 1, an enormous quantity of driftwood is carried down by the water, which runs bank full, owing to the obstruction caused by the broken ice. When the ice is fairly out the river falls a little, and all along the bars, low banks, and level beaches this wood is stranded, to remain until the freshet of next spring. It is mainly upon this driftwood that the steamers depend for fuel. The two old companies have landings scattered along the river and Indians employed during the winter cutting up the wood and sledding it to places where the steamer can reach the bank.

The population of the Yukon is small in proportion to the area. The reliable Indians are few and already engaged. When the first rush of the melting snows is over the river falls rapidly into its normal channel and for the most part remains there during July and August. Later the mountain springs begin to give out, or freeze at night, and the river continues to fall. Wide flats appear on either side, so that the spring drift, stranded on the shores, is separated from the channel by a wide space of sand and mud, over which wood must be carried after being found and cut into suitable lengths for use. The dry spruce burns rapidly, and 12 cords a day seems a not unreasonable estimate of the amount required to run a good-sized boat well loaded. How much of each day will be used up in procuring wood by the steamers not belonging to the two old companies any one may estimate for himself.

Taking this delay into consideration, it is evident the independent steamers are very unlikely to be able to make more than one trip up the river as far as Dawson during the season.

Let us allow two trips for each of the old companies' steamers, or, say, twenty-four loads, and one trip each for ten independent steamers. The total amounts to thirty-four loads, or less than half the number required to keep the assumed influx of people on a next-to starvation basis through the winter of 1898–'99. I cannot emphasize too strongly that no dependence is to be placed on the rare beds of inferior lignite which occur on the upper river, even were any attempt being made to work them, which is not the case. The lower river affords plenty of food in the shape of salmon; but this must be caught, dressed, and dried or salted in the height of the season, July and August, when the very men who may need it are straining every nerve to reach the upper river, where there is very little fish. Once the ice sets in, transportation over it of any large body of food, such as would be required by the assumed population, is impossible.

Enough has been said to show the impossibility of feeding 50,000 people by means of supplies carried up the river under present conditions.

We may now turn our attention to other routes of supply. We are told that the Canadian government proposes to give a monopoly of transportation over the old trail from Glenora, on the Stikine river, to Lake Teslin. No reasonable person familiar with the conditions of the region will believe that a railway 150 miles long can be built and equipped for traffic over this route in four months. No such person in his senses will claim that provisions could be taken from Lake Teslin to Dawson for a population of thousands, in the winter season, over the frozen river. It is wholly impracticable. There is, therefore, no hope of adequate relief by this route.

By the short route over the passes, if an immediate start is made, it is just possible that provisions might be rushed through before the close of navigation; but that this will be accomplished there is little reason to hope. While legislators are wrangling about special privileges, precious time is being wasted, and many lives will pay the penalty. Unless the rush of incomers is checked and the influx of people rigidly restrained, I see no escape from the conclusion that the winter of 1898–'99 will see starvation on the Yukon on an unparalleled scale. Every instinct of humanity calls aloud for the promotion of every possible transportation facility at once. Nothing but the fullest freedom in putting through every possible means of transport while there is yet time, regardless of private greed and the not un-

natural desire to retain national control of the means of transit, can be justified for a moment. The true interest of Canada, as well as of the United States, lies in the fullest development of the resources of the region, and without accepting all possible means of transportation this is impossible. Those who may be able from their own resources to push through a year's supply of provisions for themselves will in the long run be as much interested as any others in the welfare of the whole mass of immigrants, for a starving man will respect no property rights in food, and no man in the face of starving people may hope to keep his own store intact.

Leaving out of account the impending crisis on the Yukon, it is the writer's belief that it is imperatively necessary for the development of the goldfields that transportation for coal should be provided from the seacoast to the Yukon, avoiding the interrupted navigation of the Lewes river. Here, again, the change from the sea-going vessel to a river steamer on the Stikine, from that steamer to the railway, and then to another steamer on the Teslin marks the Stikine route as impracticable. One transshipment to the railway at Pyramid Harbor and from the cars to barges on the Yukon is so much simpler and cheaper as to put an end to argument.

The present method of using wood of so poor a quality as spruce on the Yukon steamers cannot last if the country is to be permanently developed. With coal floated downstream on barges from the headwaters the steamers might be abundantly supplied with suitable fuel, and two or even more trips a season might be reckoned on as a certainty. British Columbia has coal in abundance, and here would be a means of its indefinite utilization, by which a far greater profit would inure to the people of that province than is possible through any short-sighted monopoly of transportation, which would infallibly strangle the development of their Yukon goldfield in a very short time.

A broad and generous coöperation of both countries is essential to a satisfactory outcome of the projects now in contemplation. Let us hope that it may be realized before it is too late.

The length of the coast-line of Alaska is estimated at 18,211 miles, which is greater than that of the entire coast-line of the United States.

NOTES ON THE WILD FOWL AND GAME ANIMALS OF ALASKA

By E. W. Nelson,

Biological Survey, U. S. Department of Agriculture

Among the many interesting features to be seen by visitors to Alaska, the animal life is noteworthy for several reasons. During the brief summer, the otherwise desolate tundras are animated by swarms of water-fowl, which arrive from the south in spring as soon as the bare ground begins to appear, and after a short delay set about their summer housekeeping. The water-fowl on the rivers and lakes of the interior are the familiar species which winter among the ponds and marshes of the western United States. The Canada, Hutchin's, white-fronted, and snowy geese are there with swans and fresh-water ducks of many species. Besides these, sand-hill cranes and numerous waders abound. One of the most strikingly colored species along the small tributaries of the Yukon is the harlequin duck. The most interesting part of the bird-life of this region, however, is found along the coast of Bering sea. Four species of eider ducks occur there, some of which are very handsome. Among these the king, Steller's, and spectacled eiders are shown in the accompanying illustrations.*

The emperor goose is another fine bird peculiar to this country; it has its home in the marshy region between the mouths of the Yukon and Kuskokwim rivers. It is the most elegantly dressed of its kind in America. The top and sides of the head and neck are snowy white, the chin, throat, and under side of the neck blackish, and the feathers of the back a soft, silky, gray color, bordered by a black crescent near the end and tipped with white. The under surface is similar, but duller, and the feet are vivid orange.

The black brant pass along the coast of Bering sea in great numbers every spring, and afford royal sport to persons fortunate enough to choose good stands while the flight lasts.

During the four years the writer lived at St Michael water-fowl was a very important item in the bill of fare, and when the

* I am indebted to Mr F. W. True, Executive Curator, U. S. National Museum, for the photographs of bird and mammal groups in the Museum which illustrate this article.

frosty autumn days approached he sallied out with his companions into the marshes to lay in a supply of ducks and geese for winter. The question of cold storage cut no figure, for the two or three hundred birds brought in were drawn and hung up in an old warehouse and the climate did the rest, enabling us to have roast duck or goose during the entire winter.

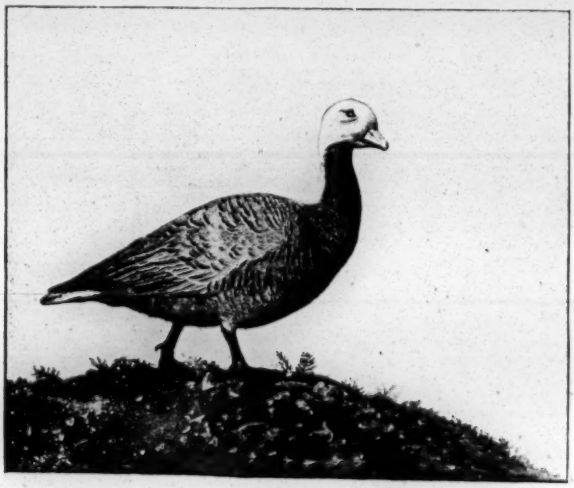
HARLEQUIN DUCK SPECTACLED EIDER
KING EIDER STELLER'S EIDER

Among the numerous berries growing wild on the treeless hills of this coast, a kind of blueberry is very abundant in September, and the young ducks feed upon it until they become excessively fat and so delicately flavored that they are delicious morsels. We became tired of hung duck, however, before the winter ended, and when the first solitary goose came flying over in spring, on a reconnoitering trip, there was general rejoicing. I still remember the hearty zest with which we put an extra edge on our knives and attacked the pioneer old gander that fell to our guns. He was lean and tough after his long flight, but was thoroughly enjoyed as an earnest of the coming season of plenty.

Two kinds of ptarmigan are common on the mainland, and will be considered dainty birds by many a hungry prospector,

although, to tell the truth, they are about the poorest flavored of the American grouse. Their handsome summer plumage of mottled brown gives way in winter to one of snowy white. In winter, in the valley of the Kuskokwim the ptarmigan called willow grouse gather in large flocks. During my sledge journeys I sometimes encountered flocks of hundreds among the patches of scrubby willows, and when flushed it seemed as if the snowy surface of the ground had suddenly burst up and taken wing.

When the first mossy knolls appear in spring the willow grouse begins to lose its snowy winter dress. At first a few brown feathers show about the base of the bill and gradually increase in



EMPEROR GOOSE

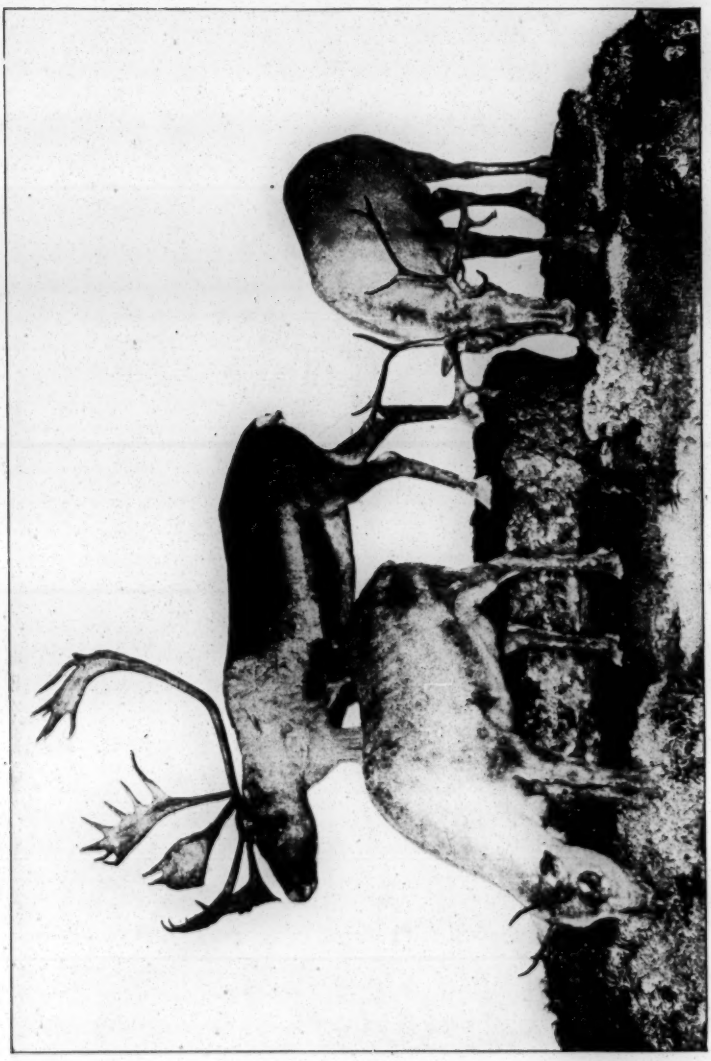
number until the entire head becomes brown while the body is still white. This progressive change keeps pace with the melting snow, and with the disappearance of the last drifts the last white feather has been dropped and the bird is in full summer garb. The willow grouse begins its courtship in May, with the appearance of the first brown feathers, and it is vigorously carried on with loud challenging notes of defiance, accompanied by many fierce rough-and-tumble fights. When the ground is mostly bare, the snow remaining only in scattered drifts, the males choose these white patches as the stage upon which to strut and ruffle for the admiration of their female friends. In the tundras they may be seen and heard on all sides as they fly up with stiffened

wings a few yards above the snowbanks and then glide down, uttering loud harsh notes. Every now and then the efforts of some gallant cock become too obnoxious for his neighbor, who starts full tilt for his detested rival. The latter likes nothing better and meets the enemy in mid-air. They clinch and fall to the ground, apparently using beak, wings, and claws in the encounter. During such times the moult of white feathers is profuse and the combatants are the center of a perfect blur of whirling plumage. Directly one of the birds gets enough and starts off in hasty flight, pursued for thirty or forty yards by the victor, who then gives up the chase and fairly splits his throat with exultant notes. The Eskimos take advantage of this belligerency and snare many ptarmigan by means of fine sinew nets placed on small stakes set on the snow around stuffed skins of male birds. The hunter conceals himself and imitates the challenge cries until a neighboring grouse dashes blindly at his supposed rival and becomes enmeshed in the net.

Aside from the birds which have a definite value as food are numerous smaller species, among which the "whisky jack" will become a familiar character to the miners. He is a kind of jay with a dull, smoky-brown coat and bright inquisitive eyes, and is withal an intelligent and companionable little chap, who has no hesitation in sharing your camp for the gratification of a frank curiosity and sound appetite. His impish ways were always highly entertaining to me and I do not doubt will furnish amusement to many a gold-hunter in his lonely camp.

Although I have dwelt upon the birds because they are more numerous and more generally distributed than most other kinds

SEA OTTER



BARREN GROUND CARIBOU

of game, the man who loves the rifle will find his opportunity among the mountains and valleys of the interior. Formerly large mammals were much more numerous in Alaska than at present, and the decrease has come about almost entirely since our ownership of the country. The history of the fur-seal is well known. The sea otter is another animal that is passing away. Its doom is even more certain than that of the fur-seal, for it is a dangerous thing for an animal to wear a coat worth from five hundred to a thousand dollars. All that has kept the sea otter from extinction is its shyness and the fact that the stormy parts of the sea it frequents render its pursuit hazardous and uncertain. Upon the mainland are several fine mammals, among which native reindeer are the most generally distributed. There are two kinds of these deer—a large, dark-colored one, called the woodland caribou, which lives in the wooded district of the upper Yukon, and a smaller, paler kind, called the barren ground caribou, which lives in the open tundras or treeless country. Barren ground caribou were once exceedingly numerous, and the coast hills along the shores of Norton sound are still scored with their trails, leading diagonally up to the cool summits, where the animals used to go in summer to avoid the mosquitoes that swarm on the tundras. But even so far back as 1877 the caribou was very rare along most of the coast of Bering sea. When Alaska passed under American control it became possible for the natives to secure breech-loading rifles, especially where whalers and trading schooners called, and the result was a rapid slaughter of the large game.

Since the barren ground caribou usually live in the open tundras where there is no cover, it is extremely difficult for the hunter to approach unseen. Like the antelope of our western plains, they are inquisitive animals, and before starting away often make a circuit about anything which excites their interest. Before they became sophisticated by the common use of guns, the Eskimos had an ingenious method of stalking them in open ground, which the old hunters told me was very successful. The Eskimos hunted in pairs, and when they found a bunch of caribou on an open plain they would start directly for the animals, one hunter walking immediately behind the other, keeping step, with their bodies touching, so that from the front they appeared like one man. When they were still some distance away, the caribou would throw up their heads and start off to circle around the intruders. The hunters kept on in their original course, appar-

ently paying no attention to them, and when the men passed the first little bush, knoll, or other cover the one in the rear sank down behind it while his companion kept on. The caribou continued to circle as the single hunter advanced, and were almost certain to pass close to the concealed man and thus afford a deadly shot at short range. The sudden appearance of the concealed hunter drew the attention of the game from the man who had gone on, enabling him to drop flat upon the ground without being noticed. The caribou, in starting off wildly from the new danger, often ran within shot of the man who had last concealed himself. Hunters told me that in this way they often got several shots before the animals finally gathered their wits and left the vicinity.

The large woodland caribou of the upper Yukon lives in the forest with the moose. The latter ranges over much of the interior, and during my residence in the country a single individual was killed in the Yukon delta close to the sea—a very rare occurrence. In summer they are rarely hunted by the Indians in the dense forests of the upper Yukon, but are killed every now and then on the banks of streams or while swimming across them. In winter they wander from place to place, browsing on the tender twigs of cottonwoods, white birches, and willows, until the increasing depth of snow forces them to unite in "yards." When caught in deep snow or with a heavy crust they are easily killed by the Indians who follow them on snow-shoes.

On the upper Yukon the old method of moose hunting in early winter was for the Indians to go out on snow-shoes after a heavy snowfall and search for fresh trails. When one was found the swiftest runner, stripped to a shirt and breeches and carrying a light shotgun loaded with ball, started off after the moose, while the women and slower runners followed. Sometimes a moose would run eight or ten miles before being overtaken. At this season the cold is generally very intense, and the hunter would quickly freeze if he stopped while heated from his long run and with so little clothing. For this reason, after killing the moose, he returned to camp at a run, leaving the followers to cut up and drag the carcass home. When there was a light crust, small dogs were used to bring the moose to bay and enable the hunter to kill it with less exertion. Before the snow fell in autumn the moose were stalked in the dense spruce thickets, but they were very wary animals, and usually became alarmed and started off at a swift trot, with a great clatter of hoofs, before the hunter

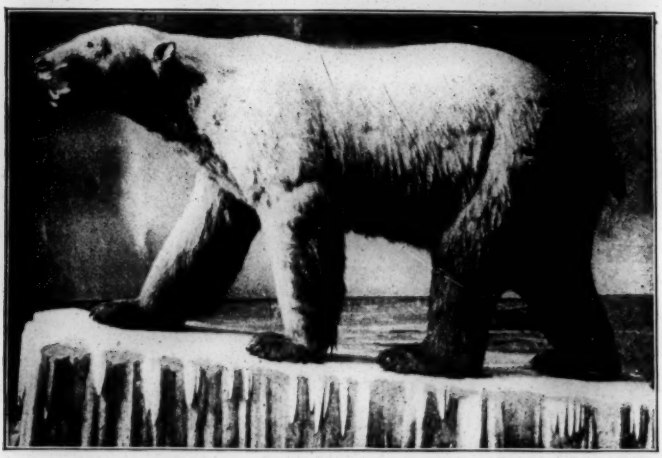
caught sight of them. At such times the Indian, knowing the country and the habits of the game, would run at his best speed to the opposite side of the small basin or valley and take a position where he could see for some distance on all sides, for when started in this manner the moose often made a wide circuit and returned within gunshot.

DALL'S MOUNTAIN SHEEP

Two species of mountain sheep, quite different from one another and from the Rocky Mountain bighorn, are known in northwestern America. The first of these, a superb, snow-white animal, was described by the writer some years ago as *Ovis dalli*, in honor of Prof. Wm. H. Dall, the pioneer scientific explorer on the Yukon. The specimens upon which my description was based were obtained from the Fort Reliance country by Mr L. N. McQuesten, now President of the Order of Yukon Pioneers. Dall's mountain sheep is found over a wide area, from the low hills beyond the tree limit near the Arctic coast south across the Yukon and Kuskokwim to the Alaskan range. Last year Dr J. A. Allen described another species from the headwaters of the Stikine river and named it *Ovis stonei*. But little is known of this handsome animal, which has a dark, almost iron-gray, coat, very different from the white of Dall's sheep. The discovery of these two sheep in northwestern America indicates that we may expect other interesting, if less striking, new forms of animal life in the mountains of that region.

In the high mountains bordering the Pacific coast, north of Sitka, mountain goats occur, but we have little definite information concerning their range and abundance. Owing to the white color of Dall's sheep, it is quite probable that in many cases they may have been mistaken for goats.

Bears also are very numerous in some places, and several kinds are known to occur. The huge bear of Kadiak and the Alaskan peninsula is the largest species in the world, and the skull of an old male looks as if he belonged to the animal life of a former geologic age, when beasts of gigantic size roamed the earth. Black bears are generally distributed over the mainland, except on the barren tundras bordering the Arctic coast. About the last of October or first of November they find a sheltered cleft or cavern in the rocks, where they make a bed of leaves and grasses and hibernate until the warm days of April bring them out again. On the upper Yukon the Indians kill them with arrows, guns, or spears. Some of the bravest and most powerful of the hunters will attack them armed only with a long-bladed knife. In such cases the hunter wraps a blanket about his left hand and arm, and with it thus protected thrusts it out for the bear to seize as it rises upon its haunches, giving him an opportunity to make a fatal thrust under the guard thus formed. Both Eskimos and Indians give these animals credit for supernatural knowledge and cunning. The Eskimo hunters are very careful not to speak in a disrespectful manner of bears, and are especially guarded



POLAR BEAR

against letting any one know of their plan to go on a bear hunt. They believe firmly that if they should speak of such intention these animals would know it at once and would lie in ambush to attack them. Bears figure largely in the folk-lore and ceremonial dances of the Eskimos on the lower Kuskokwim and Yukon rivers.

About the Arctic coast the polar bear is a regular winter visitor, and a half-grown individual was killed near St Michael in August, 1880. They are common on the pack-ice of the Arctic ocean north of Bering strait, and many were seen during the cruise of the *Corwin* in 1881. The accompanying illustration represents a female killed by the writer near Wrangel island, while with the *Corwin*. In summer these animals are usually well fed and avoid encountering men whenever possible. In winter, when hunger presses, they become dangerous, and I have heard of several Eskimos who were killed and have seen others who were badly scarred from encounters with them.

In the fall, as the pack-ice comes south through Bering strait, it brings great herds of walruses and many white bears. The latter sometimes reach the Fur-Seal islands, but only at rare intervals. Some years many of the bears fail to retreat beyond the strait early enough in spring and are left stranded on St Matthew and St Lawrence islands. During the summer of 1874 Mr Elliott and Lieut Maynard found them on St Matthew island to the number of several hundred. When these gentlemen landed on the neighboring Hall island the same season sixteen white bears were in sight as the boat approached the shore, ten of which were together on the beach. Quite a number were killed and none showed fight. They were fat and when asleep were easily approached. When aroused they stood up and sniffed at the party as if to learn whether they were friends or foes, and when the men were scented the bears ran back into the hills. At this time they were seen feeding on grass and roots, with motions like those of a grazing hog.

Aside from the whales, the walrus is the largest Alaskan mammal. Formerly it was very numerous around the islands and along the American coast of Bering sea and the Arctic ocean. During the cruise of the *Corwin* we saw thousands of them on the border of the pack-ice. The Eskimos report the female walruses to be very dangerous in April and May, when they have young. At that time they say an old female will attack a man in a kyak on sight, and becomes as fierce and dangerous as an

old bear. An Eskimo living at Cape Vancouver once told me of an encounter he had had with a walrus while seal hunting in the drift-ice off the cape, in which he and a companion had a narrow escape. They met and killed a young walrus without having seen the female. A moment later she arose in the water and, catching sight of the hunters, uttered a hoarse bellowing cry and dashed at them. The men paddled for their lives and reached a cake of ice just in time to escape. Here they were kept prisoners for nearly a day. Several times, supposing she had gone, they launched their kyaks, but the moment they did so she appeared and drove them back on the ice. During our cruise in the Arctic we saw many females with young, and the watchfulness of the old ones was very noticeable. The young nearly always swam directly in front of its mother, and the latter, in diving, always carried the little one under with her by resting the points of her tusks on its shoulders and forcing it down.

In the old days, when caribou were abundant, wolves were common and ran in large packs. With the growing scarcity of caribou the wolves decreased, until, during my residence at St Michael, they were uncommon along the coast of Bering sea and the adjacent interior. The white and blue arctic or stone foxes are common on the barrens, and red foxes are also common and much more widely distributed. The region about Dawson City was formerly noted for the number and quality of the black fox skins taken there every winter. Canada lynxes, wolverines, land otter, American sable and mink are among the fur-bearing animals which helped make up the main wealth of Alaska until recent developments.

Among the "rats and mice and such small deer" are many animals of more or less interest. The whistling marmots live in the mountains about the upper Yukon and Tanana rivers, and the bob-tailed little conies are also found in that region. The last-named animal makes its home in broken masses of rock and has an amusing way of barking at strange visitors with a squeaking voice like that of a toy dog.

The great increase in the population of Alaska which is now taking place cannot but have a decided effect upon the large game. Most of the prospecting parties will be provided with rifles and will take every opportunity of securing an addition to their scanty camp fare. With this going on in thousands of localities in the hitherto unvisited areas, the effect will necessarily

be disastrous to such animals as bears, mountain sheep, caribou, and moose. Unfortunately not a museum in the world has even a passable representation from Alaska of any of these animals.

The threatened early extermination of such fine species is to be greatly deplored, but cannot well be avoided, and it is altogether probable that within two or three years it will be extremely difficult, if not impossible, to secure specimens for scientific purposes. The U. S. National Museum in Washington is the proper repository for a full representation of the animals indigenous to our territory, for exhibition purposes as well as scientific study, and it will be a great loss to science if any of the large Alaskan mammals become extinct before a proper series of skins and skulls is in the possession of this institution. I wish to impress this upon settlers and others going to Alaska the present season, in the hope that, having their attention called to the importance of saving specimens, they may take a patriotic interest in placing them in the National Capital.

CLIMATIC CONDITIONS OF ALASKA

By General A. W. Greely, U. S. Army

The most obvious elements of climate are those of temperature, humidity, precipitation (rain, snow, fog, etc.), and winds, and of these temperature and precipitation affect most potently the comfort and prosperity of man.

It is about 25 years since the writer was one of several consulted by the late General A. J. Myer as to the establishment of stations of observation in Alaska, and in 1881 he was consulted by the late General W. B. Hazen regarding the extension of the system of such observations in the same remote and almost unknown region. A certain class of persons—those who plume themselves on being strictly utilitarian—then sneered at a policy that would expend a few hundred dollars annually for the purchase of instruments and for the cost of recording meteorological observations by volunteer observers on this outer edge of this civilized world. "Who knows or cares," said they, "whether the Yukon river flows into Bering sea or the Arctic ocean, and of what use is a knowledge as to the summer and winter conditions under which the animals of this river valley live and thrive?"

Today the question answers itself, and tens of thousands of men eagerly search for reliable and satisfactory data on which to base their plans and outfits for their search for fortunes in the gold regions of the upper Yukon. It therefore seems timely to bring together such observations of the climatic conditions of the different parts of Alaska as may give at least a general idea as to the weather to be encountered.

Most extensive countries have two kinds of climate: first, the continental type, where far from the sea we find hot summers, cold winters, light rainfalls, and much sunshine; second, the littoral or shore type, where the heat of summer and the cold of winter are modified by moist winds from the ocean bringing copious or heavy rains. To these Alaska adds a third kind, the marine or island type, where the winters are, comparatively speaking, unduly warm and the summers unduly cool, while rains, fogs, and cloudiness are prevalent through the greater part of the year.

Considering first the marine climate, it is to be said that it prevails on all the outlying islands of Alaska in the Aleutian archipelago and in parts of the Alaskan peninsula. Naturally the extremes of temperature become more marked to the north.

The littoral or coast climate of Alaska is materially tempered by the oceanic current usually known as the Japan stream, which keeps at an abnormally high temperature the moisture-laden winds that, blowing landward, deposit large quantities of rain or snow, thus setting free large quantities of latent heat to warm the land. The enormous quantity of such heat and its influence on the temperature of the air may be imagined from Haughton's calculations, which show that "one gallon of rainfall gives out latent heat sufficient to melt seventy-five pounds of ice or to melt 4.5 pounds of cast iron."

The settlers and miners of Alaska will find that the coast conditions change rapidly as one goes inland to a continental climate of the most pronounced type. Cool, cloudy, and rainy summers, and raw, damp, foggy, and not very cold winters are to be anticipated along the immediate main coast or the inlets. Wherever rapidly rising shores are found the hills or mountains are subject to heavy precipitation, with resulting deep snows and low temperatures for a considerable part of the year.

Almost everywhere in Alaska the climate changes decidedly within one hundred miles of the mainland coast and becomes continental in its characteristics. Rain and snow are less fre-

quent, the summers are longer and warmer, the skies less cloudy, and the winters marked with excessive cold, though the winds are much lighter and storms are infrequent. Continuous freezing weather, usually below zero, continues for months, and even in July, with midday temperatures of 70° to 80°, it is an almost daily occurrence for the temperature to fall during the night to the neighborhood of the freezing point.

Let us now turn from general statements to specific data from such selected stations as are acknowledged as climatically typical of various parts of Alaska. In so doing one turns naturally to Dall's admirable article and tables on the meteorology of Alaska, published in the *Pacific Coast Pilot*, 1879. Although his work and charts are 21 years old, yet they are the only discussion and data that have ever been published on the general meteorological conditions of Alaska.

St Paul island, Bering sea, has a typical marine climate; its lowest recorded temperature is —12° and its maximum 62°. The temperature rarely exceeds 50°, and in 1875 it only reached 48°. February is the coldest month, with an average temperature of 26.1°, and August the warmest, with a mean of 48.4°.

Sitka is a typical coast station for extreme southern Alaska and Point Barrow for the northern. In 45 years Sitka had extreme temperatures of 88° and —4°. The coldest month is January, 31.4°, and the warmest August, 54.9°. Every year it is either rainy or snowy 200 days on an average. In 1856 rain and snow fell on no less than 286 days, but in 1883 there were only 114 such days. The annual rainfall is very great, being 81 inches, of which about one-half falls from September to December.

Point Barrow, the extreme northern point of Alaska, is in 71° 23′ N., 156° 40′ W., and its climate is important as indicating closely that of the coast-line of the whole tundra or moorland region situated along the Arctic ocean. It should be remembered that as one goes inland the winter becomes colder and clearer; the summers, warmer and drier. The observations of Capt. P. H. Ray, 1881–'83, and of H. M. S. *Plover*, 1852–'54, are the base of the following notes: The winter is long, as freezing weather obtains from early September to early June, when summer comes in full force. The mean winter temperatures are: December, —15.4°; January, —17.5°; and February, —18.6°, with occasional periods when the cold is from 40 to 52 degrees below zero. The average heat of July is 38.1°, and of August 37.9°; but the temperature often rises above 50° and has touched

65.5°. The snowfalls are light, amounting (melted) to 8.25 inches, the greater part falling from July to October. The severity of the cold is indicated by the fact that the ground was found frozen, as far as excavations were made, to the depth of 38 feet. Winds and gales are most frequent from August to November and the lightest winds are from February to May. The natives quit their snow huts for tents about May 1. The tundra is snow-free late in June.

The watershed of the Yukon includes the regions whose climatic factors are at present of the greatest interest and prospective value. Fortunately, there are sufficient data to justify clear-cut statements that must closely approximate the truth.

St Michael, 68° 28′ N., 162° 04′ W., although an island, immediately borders the mainland near the mouth of the Yukon. Its climatic characteristics have been fully set forth by Mr E. W. Nelson. The winter is very long, the average temperature being below the freezing point from October to April, inclusive. The coldest month, February, averages from twelve years' observations, −2.3°, but in 1877 it was −23.7°. A temperature as low as −55° has been observed. The warmest month, July, has a mean temperature of 53.6°. It should be said that one summer month of any year closely resembles the same month of any other year, but there are great variations between the same winter months of various years. Spring bursts into summer about the middle of May, but it reverts more slowly to winter through a partial autumn. Summer is very depressing, from its frequent spells of misty rain and the prolonged presence for many days of unbroken, low clouds. Winter is marked by long periods of beautifully clear days, which are usually of intense cold. Strong gales occur irregularly through the year. While most frequent in autumn, yet fierce winter storms are not uncommon, which, with their terrible accompaniments of blinding clouds of snow and temperatures considerably below zero, are wisely dreaded, as even the hardy natives sometimes perish therein. The harbor closes as a rule by October 15, and rarely opens before June 10. The breaking up of the Yukon ice about the 1st of June is usually followed by several foggy days. Very light rains or snow are frequent and continued. The precipitations scarcely reach 18 inches annually, of which the greater part falls from July to September. Snow falls often in summer, sometimes in notable amounts. Rain or snow falls three days out of five from August to October, but only one out of four from January to March.

At Nulato, 60° 40′ N., 158° 13′ W., the summer consists largely of warm, hazy days, free from high winds or much rain. The Yukon closes about October 20 and opens late in May. At Ikogmut mission, 61° 47′ N., 161° W., the river closes about November 4 and breaks up about May 23, but in 1849 it remained closed until June 5.

Mr A. J. Henry gives in the *Monthly Weather Review*, August, 1897, other temperature means for short periods. The lowest monthly means are as follows: Anvik, 62° 37′ N., 160° W., December, —2.1°; Tuklukyet, 65° 10′ N., 152° 45′ W., January, —11.1°; Belle Isle (a short distance up the Yukon from Circle City), 65° 30′ N., 142° 38′ W., January, —15.8°; Camp Colonna, about 64° 45′ N., 141° W., February, —15.3°; Camp Davidson, about 67° 30′ N., 141° W., January, —17.4°; Fort Reliance, 64° 10′ N., 139° 25′ W., January, —28.7°.

The most important temperature observations in the Klondike regions are those made at Dawson from August, 1895, to November, 1896, by Mr William Ogilvie, whose scientific standing and ability are guarantees of their worth. While they do not give all the mean temperatures, yet they record the minimum and much information of value. In July only the temperature did not sink below freezing. During June, July, and August, 1896, the temperature rose on 29 days above 70° and thrice above 80°. The extreme severity of the winter is indicated by the fact that from December 1, 1895, to February 1, 1896, the temperature fell below zero every day. On 28 days it fell lower than —40°; on 14 days, lower than —50°, and on nine days lower than —60°. The mean temperature for January, 1896, was —40.7°, and for February, —35.4°. Bright weather is the rule. From October 1, 1895, to the 1st of May following, snow fell only on one day in seven. In June, 1896, however, it rained on 12 days and the temperature rose above 80°. The Yukon broke up on May 17 and ran thickly with ice until the 23d, when the first boat came down the river. Except for two weeks, the Yukon was free from ice until October 29; it was frozen solid November 5.

The temperature observations at Fort Reliance, adjacent to Dawson, in 1880–'81, communicated to THE NATIONAL GEOGRAPHIC MAGAZINE of November, 1897, by Mr E. W. Nelson, confirm the severity of the winter climate. The Yukon was frozen from November 2 to May 14. The mean temperatures for December, January, and February were —31°, —7°, and —29° respectively, and on 35 days the thermometer registered between

—40° and —66°. Snow fell but one day in February and 25 days were perfectly clear.

With the middle of May summer comes at once, the Yukon breaks up, the snow vanishes as if by magic, and vegetation develops with astonishing rapidity until opening September brings sharp frosts almost daily.

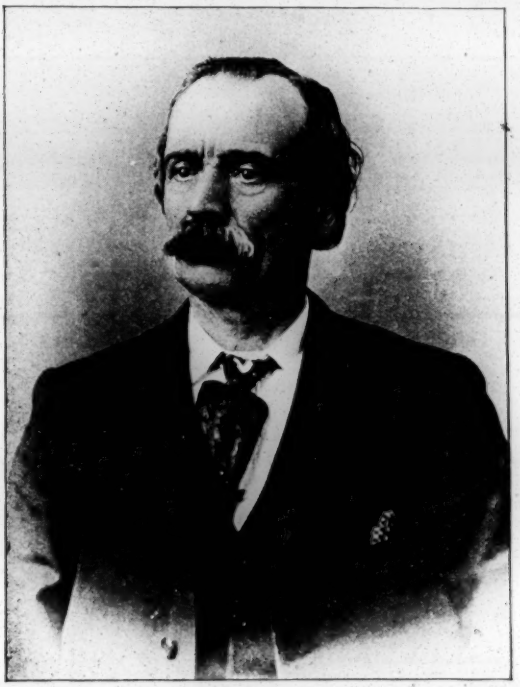
By methods familiar to meteorologists the temperature means for the three coldest months—December, January, and February —have been calculated for all the points hereafter named, except for St Michael, which is definitely known. St Michael, mouth of Yukon, 3.3°; Anvik, 62° 37′ N., 160° W., —1.2°; Circle City, —10.2°, and Dawson, 64° 05′ N.′ 138° W., —24°. Any single winter may be considerably warmer or colder than is here calculated, but the means are practically correct and afford a good idea of all intervening points in the valley of the Yukon, and therefore have a definite value for all who seek to wrest from rugged and inhospitable Nature the golden hoards of Alaska.

A YUKON PIONEER, MIKE LEBARGE

The first white men to explore the Yukon between the Russian settlements and the Hudson Bay post called Fort Yukon were Frank Ketchum, of St Johns, New Brunswick, and Michel Lebarge, of Chateauguay, Quebec. After the death of the lamented Kennicott, at Nulato, in May, 1866, the expedition which he had planned and which was only waiting for the ice to pass out of the river to make a start, was loyally and successfully carried out by his chosen and faithful companions. They ascended the river from Nulato to Fort Yukon, and then returned, crossing the portage to St Michael to make their report to the commander-in-chief of the Telegraph expedition, Col. Chas. S. Bulkeley, at that port. The following year the party was augmented by Wm. H. Dall and Frederick Whymper, who wintered at Nulato. Ketchum and Lebarge undertook a remarkable journey over the frozen river to Fort Yukon in March, accompanied by two Indians. They arrived safely at their destination just as the ice was breaking up, and after the freshet was over took birch canoes at Fort Yukon and continued their explorations to the junction of the Lewes and the Pelly at the site of old Fort Selkirk. Returning, they joined Dall and Whymper at Fort Yukon, the second half of the party having made the journey to that point in canoes.

The united party then descended the river to the sea and reached St Michael in safety, thus making the first continuous trip from the headwaters to the sea.

Michel Lebarge was born in Chateauguay in 1837, of Canadian parents of French origin. In May, 1865, he started for California, on the steamer *Golden Rule*, by the Nicaragua route. On the same vessel were Kennicott and his companions on their way



to join the expedition of the Western Union Telegraph Company for the exploration of Russian America. The crossing of Nicaragua was accompanied by a number of lively incidents, including the loss of a steamer on the San Juan river; and the excellent qualities displayed by Lebarge in trying circumstances attracted the attention of Kennicott and led to the engagement of the young Canadian in the corps of northern explorers. After the disbanding of the Telegraph expedition, in which the courage, ingenuity, and companionable characteristics of Lebarge had made him a universal favorite and cemented an enduring friendship with his American comrades, in 1868 he engaged in the fur trade in the Yukon region with a number of associates, under the name of

the Pioneer American Fur Co., and in 1871 entered the service of the Alaska Commercial Company, from which he retired, with a modest competency, in 1875. He is now living in his native town in the Province of Quebec. An indefatigable traveler, a delightful companion *en route* or by the camp fire, full of expedients whatever befell, tactful and adroit in his dealing with the natives, generous and helpful to the inexperienced—in short, a capital voyageur of the best type—no one who knew him in those days but thinks of him always with admiration and affection. His services to geography are commemorated by Lake Lebarge, on the direct route to the Klondike, and Lebarge river, an affluent of the Yukon from the north below Fort Yukon. The name Lebarge has been variously spelled; the form in use during the expedition has been adopted as here written by the U. S. Board on Geographic Names. Frank Ketchum lies under the green turf of an Unalaska hillside. May his faithful companion and our good friend survive for many happy years.

WM. H. DALL.

ALASKA AND ITS MINERAL RESOURCES*

By SAMUEL FRANKLIN EMMONS,

U. S. Geological Survey

INTRODUCTION

Alaska was first visited by a Russian expedition under Bering in 1741. In 1799 the territory was granted to a Russo-American fur company by the Emperor Paul VIII, and in 1839 the charter was renewed for twenty-four years. In 1867 it was ceded to the United States for a money payment of $7,200,000. The first mining excitement in the interior was in the Cassiar mining district in British Columbia around Dease lake, near the head of the Stikine river, from 1871 to 1887. Later, prospectors found their way into the more northern regions and down the valley of the Yukon into American territory, where they discovered valuable placers on Birch creek, Mission creek, and Fortymile creek, small southern tributaries of the Yukon. In the autumn

*This paper, published with the permission of the Director of the U. S. Geological Survey, is an abstract of a pamphlet prepared by his direction to accompany a map of Alaska, and giving such information, compiled from data in the possession of the Survey, as it was thought would prove useful to the traveler or prospector who might visit that region.

of 1896 still richer discoveries were made a short distance east of the boundary, along the Klondike river, and a great rush of miners to these now famous diggings set in the following spring.

Accurate data with regard to the geography of Alaska it is as yet difficult to obtain. The immediate coast-line and the many islands which border it have been mapped by the United States Coast and Geodetic Survey, and the course of the great Yukon river, comparable in size to the Mississippi, was determined by the Western Union Telegraph Company's expedition in 1867 and by an expedition in 1869 under Lieut. C. W. Raymond, of the United States Engineers. What other information has been obtained with regard to the interior is derived from route and sketch maps made by individual explorers, who generally followed the valleys of the larger streams. Vast tracts of mountain land between these streams are yet practically unknown.

Ketchum and Lebarge, of the Western Union Telegraph expedition, were apparently the first white men to traverse the entire length of the Yukon river. They traveled on ice and snow from St Michael to Fort Yukon in the winter of 1866–'67, and in the following summer made their way to Fort Selkirk and back, joining on their return W. H. Dall, who had charge of the scientific work of the expedition, and who, with Frederick Whymper, had ascended to that point by water. In later years scientific explorations of the interior have been made by members of the Canadian and of the United States Geological Surveys. In 1887 Dawson and McConnell, of the Canadian Survey, ascended the Stikine to the Liard, the former going northwestward by the Frances and Pelly to Fort Selkirk, the latter descending the Liard to the Mackenzie and the following season crossing from the Mackenzie to Fort Yukon by the Porcupine river and ascending the Yukon to its southwestern sources. William Ogilvie, of the same corps, entered the Yukon district in 1887 and has been there most of the time since, engaged in route and boundary surveys. In 1889 I. C. Russell, of the United States Geological Survey, in company with a boundary party of the Coast Survey, ascended the Yukon river from its mouth to the head of boat navigation, coming out over the Chilkoot pass. In 1890, under the auspices of the National Geographic Society, Russell explored the Mt St Elias region from Yakutat bay. In 1891 C. W. Hayes, of the United States Geological Survey, accompanied Schwatka's expedition up the White, across Scoloi pass, and down the Copper river. In the summer of 1895 G. F.

Becker and W. H. Dall, under orders of the Director of the United States Geological Survey, made examinations of the coastal regions with reference to gold and coal, and in 1896 J. E. Spurr, assisted by H. B. Goodrich and F. C. Schrader, made a reconnaissance of the gold-bearing rocks of the Yukon district. It is from the reports of these later explorers that the data contained in the following pages have been compiled.

GEOGRAPHICAL SKETCH

Alaska has an area of 580,107 square miles. It is roughly quadrangular in outline, with a panhandle extension in the southeast along the coast and a peninsula stretching out into the ocean on the southwest, which continues in the chain of the Aleutian islands that separate Bering sea from the Pacific ocean. Its eastern boundary is formed by the 141st meridian of longitude west from Greenwich, and the westernmost portion of its mainland, Cape Prince of Wales, is on the 168th meridian, or within 54 miles of the easternmost point of Asia. In latitude it extends from 54° 40′, the southern point of Prince of Wales island, to Point Barrow, in 71° 23′ north latitude, far within the Arctic circle. Its greatest extent in a north-south line is thus 1,100 miles, and from east to west 800 miles.

The coast-line is much broken by arms of the sea, reaching far inland, either as open bays, as sounds or submerged river valleys, or as fiord-like inlets. The coast abounds in islands, which cover an aggregate area of 31,205 square miles and which as a rule are very mountainous. The chain of the Aleutian islands, reaching nearly 1,500 miles into the Pacific ocean, is largely of eruptive origin and contains many volcanic craters, some of which are yet active. They rise very abruptly from the sea, often to an elevation of several thousand feet, one on Unimak island reaching a height of 8,955 feet.

The Alexander archipelago and the adjoining coast strip, the best-known and most frequented part of the Territory, resemble the submerged portion of a narrow and precipitous mountain system. The archipelago consists of 1,100 islands, the largest and most southern of which is Prince of Wales island. It is intersected by deep and relatively narrow waterways, which often run far inland and bear evidence of previous occupation by glaciers. In some cases, as at Glacier bay, enormous living glaciers are found at their head. The islands themselves are steep-sided, and rise to an average elevation of 2,500 feet. On the seaward

side of Baranof island, one of the outer tier, on which Sitka is situated, is a volcanic crater, called Mount Edgecumbe, 2,855 feet high. Further northwestward, forming part of the same mountain line, the St Elias range, which follows the immediate coast, contains many high mountains, and culminates to the north in Mount St Elias at an elevation of 18,024 feet. Mount Logan, further inland, is supposed to be still higher, and explorers report that far in the interior, between Copper river and the Lower Yukon, there is a group of mountains, extending in the same general direction, of equal or perhaps even greater elevation, the highest point of which has been designated Mount McKinley. A second line of elevation is supposed to extend southwestward from near the head of Copper river, following the coast-line in the direction of the Alaskan peninsula.

The rivers entering into the waters of the Alexander archipelago are generally short, and only two, the Stikine and the Taku, are known to head beyond the crest of the mountains immediately adjoining the coast. The Chilkat river is a considerable and rapid stream, entering the head of Lynn canal from the northwest; it is probably less than 100 miles in length. The next river northward is the Alsek, about which little is known, but it is supposed to head on the east side of the St Elias range, in the vicinity of Mount Logan.

Copper river is a larger stream than any of those thus far mentioned, and heads in a mountainous country, containing several high peaks with an estimated elevation of 12,000 to 18,000 feet, and little known, except by the Indians. Rolled masses of native copper, of which their knives were made, were obtained somewhere in this region. A northwestern branch of this stream is said to head between the Sushitna and the Tanana rivers, possibly in the lake which on the map is represented as being drained by the Sushitna. The Sushitna also is an important stream, emptying into the head of Cook inlet, very wide and difficult of navigation near its mouth owing to the great rise and fall of the tide. Its sources are in a high mountainous region, a main northwestern branch being supposed to head near Mount McKinley.

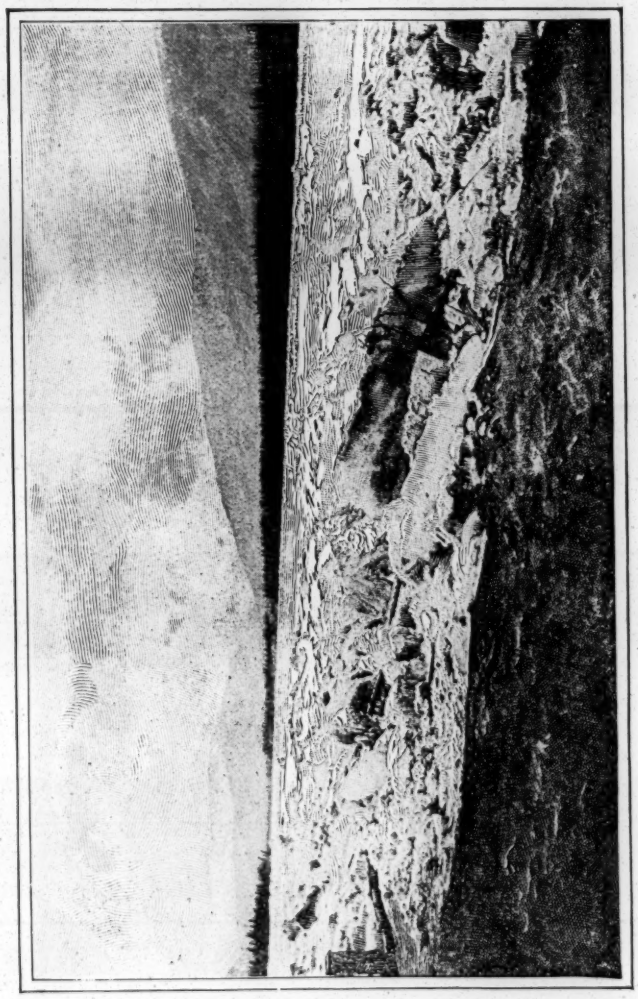
The next large river, the Kuskokwim, is the second largest in the Territory, its length being estimated at over 600 miles. It drains a mountainous region difficult of access. The Russians ascended it in boats as far as the Redoubt Kolmakof or crossed from the Yukon by a portage near Oknagamut. The currents

of the lower stream are rapid. A winter route was also used from Fort Alexander up the Nushagak and down the Chulitna; in summer the morasses along this route may not be passable.

Beyond Norton sound, into which empties the great Yukon, that drains the whole interior region, the principal streams of known importance are the Kowak and the Noatak, which flow into Kotzebue sound. The Colville river, which empties into the Arctic ocean, is supposed to head in the same general region as the two just mentioned.

The Yukon river has an estimated length of 2,000 miles, of which three-fourths is continuously navigable for river steamers. It empties into Norton sound through a wide delta in four principal mouths 50 to 64 miles in length. For about a hundred miles above the delta it has a general northwest course, then bends at right angles and has a southwest direction up to the bend at Fort Yukon, just within the Arctic circle. Here it receives the waters of the Porcupine, a stream having the same general southwest course and heading near the mouth of the Mackenzie river. Fort Yukon is distant in a direct line about 650 miles from the mouth of the river. Above this point the general direction of the river is again northwest, but a short distance east of the international boundary it turns to a north-south course, which it maintains for nearly a hundred miles, through the Upper Ramparts. It is at the bend below this north-running stretch that the Klondike river enters from the east, above which, and more or less parallel, are the Indian and Stewart rivers, all famous as draining a region phenomenally rich in gold. Near the upper end of this north-south course the White river enters in the same direction from the south. Above this the Yukon resumes its northwest course and maintains it to Fort Selkirk, which is near the head of navigation. At Fort Selkirk it splits into two main branches: the Pelly, which drains the Rocky Mountain regions to the northeast, and the Lewes, which in several branches drains the region to the southwest and the many lakes on the eastern side of the Coast ranges.

The principal tributaries of the Yukon from Fort Selkirk to Fort Yukon are, on the south side, in descending order, White, Sixtymile, Fortymile, Mission, Seventymile, and Charlie rivers, and on the north, from Dawson at the mouth of the Klondike downward, the Chandindu, Tatondu, Tahkandit, and Kandik rivers. From Fort Yukon to the open country near the mouth of the river the longer streams coming from the southeast are



VIEW ON ELDORADO CREEK, A BRANCH OF THE KLONDIKE

By courtesy of McClure's Magazine

Birch creek, Beaver, Tanana, and Nowikakat rivers; from the north come the Dall, Tozikakat, Melozikakat, and Koyukuk rivers, the latter one of the largest tributaries and said to be 500 to 600 miles in length.

The Yukon is generally a broad and muddy stream, flowing with a current of 3 to 9 miles an hour. Occasionally it runs in a narrow, rocky canyon cut through lava, or across low mountain ranges, and such stretches are locally called "ramparts." For the most part, however, its valley is wide, and the stream often spreads out into many channels with low wooded islands between, the whole covering a width said to reach 10 miles in places. Dry spruce is practically the only fuel available for steamers along the Yukon, and the supply is limited and difficult to obtain. Although the river is frozen up during eight months of the year, from October to June, its importance as a means of transporting supplies can hardly be overestimated. In the early years, when the connection between the upper and lower portions of the river was not absolutely known, the Hudson bay fur-traders were in the habit of taking their peltry from Fort Selkirk down to the mouth of the Porcupine and up that stream to the Mackenzie, preferring to make this long and circuitous journey rather than encounter the difficulties of a more direct route across the mountains to the eastward.

The international boundary between American and Canadian territory has no relation to the physical structure of the interior region; hence in this description that portion of British Columbia which lies opposite the Alexander archipelago and the coastal strip of American territory southeast of Mount St Elias will be considered as part of the general province of Alaska. The known portions of the interior region, which lie mainly south of the Arctic circle, belong to the drainage system of the Yukon river. This stream, with its various tributaries, drains the northwestern portion of the cordilleran system included between the coast and the Mackenzie river valley, which are about 700 miles apart and approximately parallel. The Mackenzie river flows from Great Slave lake into the Arctic ocean. To one tracing the broader features of physical structure northwestward from the United States through British Columbia, it would seem that the mountainous region between the Yukon and the Mackenzie represents the Rocky mountains proper, and the Alexander archipelago and adjoining coast slopes the Coast ranges. The basin of the Upper Yukon (the river above the great bend) would then

be the representative of the Great Basin region in the United States, since north of the 49th parallel the uplift of the Sierra Nevada has merged with that of the Coast ranges into one general system.

The Coast range proper is a broad elevated belt with many scattered peaks, but not differentiated into continuous ranges. Oceanward it presents an abrupt, rugged front, cut by fiord-like valleys. To the east is a plateau-like region which descends gradually to the north from an elevation of 5,000 feet in the upper lake region to 3,000 feet in the lower Lewes and Pelly river valleys. The river valleys in this stretch often lie 2,000 to 2,500 feet below the general plateau level.

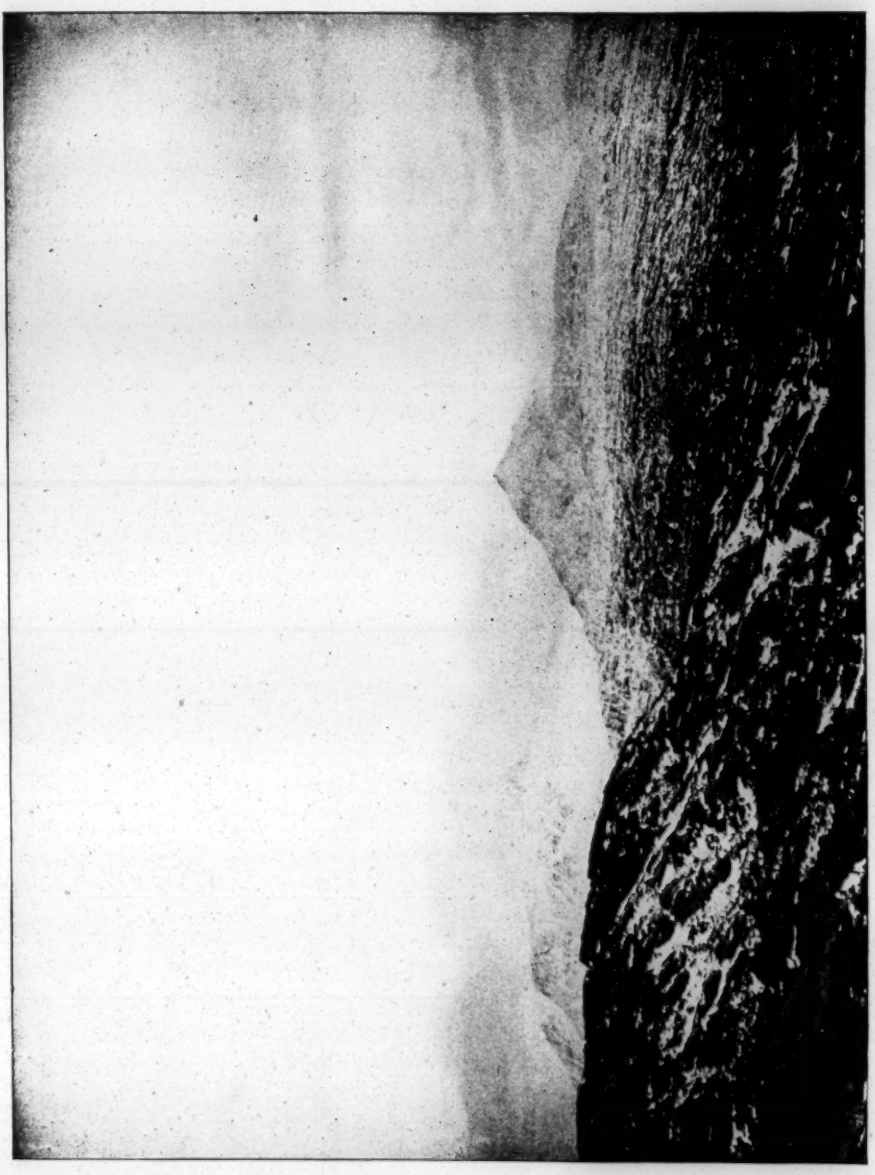
In the interior region the soil is frozen for a large portion of the year, so that there is comparatively little rock decay. Where there is no timber the surface is generally covered with an abundant growth of moss. This, wherever the surface material is sufficiently compact to become impervious to water by freezing, produces large areas of swampy tracts, even on sloping ground, which, except in the glaciated regions or when cut through by large streams, obscure the rock surface and render difficult the work of the prospector.

The northwestern continental ice-sheet, or cordilleran glacier of Dawson, which centered in British Columbia between latitudes 55° and 59° N., did not extend in this interior region north of the 62d parallel, hence the greater part of the Yukon basin has not been glaciated, except by local glaciers. This fact has been readily recognized by the geologists who have visited the region in recent times, and indeed is evident, on inspection of the maps, by the abundance of lakes above this line and their absence below it.

The Yukon or all-water route.—This route is by ocean steamer from Seattle or San Francisco to St Michael, near the mouth of the Yukon; thence by river steamboat up the Yukon to Dawson. The length of this route is about 4,000 miles, it being nearly 2,700 from Seattle to St Michael, and about 1,300 up the Yukon to Dawson. Those taking this route aim to leave St Michael early in July, in order to avoid the delays in upstream progress caused by sand-bars at low stages of water later in the season. The time from Seattle to St Michael is about twenty days, and that from St Michael to Dawson the same, making about forty days for the trip. Under favorable weather and circumstances it may be made in less time. Though this route is the one over which commercial companies operating in the Yukon country

transport their goods, it is seldom used by miners who wish to enter in the spring, since at that season it takes several weeks longer to make the trip by this route than it does to make it by some of the trails mentioned below. It is, however, highly advantageous for persons unfitted to rough it on the trails.

The Skagway or White Pass route.—From Seattle to Skagway, a distance of 1,115 miles, the route is by ocean steamer northward along the coast, and finally up Lynn canal. It is practically a still-water route, being protected from the swells of the ocean by an almost continuous barrier of densely wooded islands. The trip requires about three and one-half days. Skagway is located on the east side of Dyea inlet, a branch of Lynn canal. Its population, which is much increased by people who have been unable to get across the trail, is said to be about 8,000. Dyea is situated four miles north of Skagway, west of the mouth of Dyea river and at the head of Dyea inlet. The rise and fall of the tide in this inlet is about 24 feet. At Skagway steamers find good anchorage within half a mile of the beach, to which freight is taken in lighters at high tide, which are unloaded when the tide recedes. Several newly built wharves are said to be now in practical use, and the facilities for landing cargoes are greatly superior to those at Dyea. From Skagway the trail leads northeastward up the valley of the Skagway river, crossing the mountains at White pass and running thence northward to the head of Lake Bennett, whose waters flow into the Yukon. The summit of White pass is 2,400 feet above sea-level, and its distance from Skagway is 18 miles. For the first four or five miles there is a good wagon road, which crosses the river several times by ford. At high stages of water, however, freight must be packed across on foot bridges. Beyond this are long stretches of very miry and rocky ground, where a loaded man will sink knee-deep in the mud. There are also several steep and rough ascents, of which Porcupine hill is the sharpest. The last two miles before reaching the summit is a steady, hard climb, but presents no cliffs or precipices. Many horses have been killed or have died on this trail. Seventy-five to 100 pounds make a good load for the ordinary packer. From the summit to Lake Bennett, 17 miles, the trail improves, although still bad. It is for the most part gradually downhill, over an undulating, rocky surface. The timber-line is reached again at The Meadows, about five miles beyond the pass, which is the ordinary camping-place. The trail passes the two small lakes known as Summit and Middle lakes, on which fer-



SUMMIT OF WHITE PASS—FALL OF 1897

From a Photograph by E. S. Curtis

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riage may be secured when the water is not frozen. Midway between the latter and Lake Lindeman, about three miles before reaching Lake Bennett, the Canadian custom-house officials have put up a large log cabin, which is used as a place of shelter by those crossing the trail. At this point a trail branches off to the right down to Tooshhie lake; but as there are seven miles of impassable river between Tooshhie and Tagish lakes, travelers bound for the Yukon are warned from taking this route. At the head of Lake Bennett the Skagway joins the Chilkoot trail. The Skagway trail is somewhat longer than that over the Chilkoot pass, but the pass is much lower. It requires, however, considerable improvement in bad and swampy places. This route has been recently recommended by the United States Quartermaster's Department of Puget sound.

The Dyea or Chilkoot Pass route.—This trail has been used by the Indians for generations, and until a year ago was practically the only route followed by miners and prospectors who entered the interior. It is the shortest route to the headwaters of the Yukon.

Dyea (or Taiya) is the Indian word, meaning *pack* or *load*. Owing to the extensive shoals at the head of Dyea inlet the conditions for anchorage and discharging cargoes from ocean vessels are less favorable than at Skagway. They are either unloaded by means of lighters or put upon a rocky point about a mile from the beach, whence they are hauled off in wagons. Dyea trail runs northeastward up the Dyea river and across the Chilkoot pass, at an elevation of 3,500 feet, to the head of Lake Lindeman, a total distance of 28½ miles. The summit is 13 miles from Dyea, the first 6½ miles following a comparatively open valley, in which there is a good wagon road. Owing to the windings of the stream within the walls of the valley the river must be crossed several times—by fords in summer, by ferries in spring when the water is deep. The trail then enters a narrow canyon with steep, rocky walls, which it follows to Sheep camp, at timber line, 4½ miles further on. Through the canyon the trail is rougher, but horses have been successfully used for several years in packing to Sheep camp. Good camping places are found all along the route from Dyea to Sheep camp, and at several points refreshments may be obtained. Sheep camp is the last camping place on the west side of the range, as from there on there is no timber or fuel until Deep lake, on the other slope, 12 miles distant, is reached. From Sheep camp to Scales, where packs are weighed by the Canadian authorities, a distance

of 3¾ miles, the rise is about 1,800 feet. The trail is free from mud, and traveling is not difficult, though in places the ground is covered with bowlders. From Scales to the summit of the pass the ground rises 1,000 feet in a distance of about half a mile, and masses of broken rock or talus make the climb very difficult, and impossible for pack animals. The building of an aerial or wire tramway, with buckets carrying 400 pounds of freight, has been contemplated for this portion of the route. From the summit of Chilkoot pass to Lake Lindeman, a distance of 15½ miles, the trail descends first very steeply to a small lake called Crater lake, and thence more gradually along the drainageway of a chain of lakes known as Long, Canyon, and Deep lakes, which are connected with one another and finally with Lake Lindeman by small streams. Till late in spring the whole of this drainageway is frozen over, and one travels from the summit to Lake Lindeman by sled. On either side of the pass, especially on the south, snow sometimes accumulates to a depth of 50 or 60 feet, forming a sort of névé of limited extent. Late in the season, when the drainage is open, a ferry sometimes plies on Long lake, a distance of four miles. From the foot of Lake Lindeman there is portage past the rapids to the head of Lake Bennett, where the Dyea and Skagway trails meet.

From the head of Lake Bennett to Dawson, 548 miles, there is a continuous waterway through lakes and rivers, which may be followed in summer by boat and in winter on the ice. Long stretches are navigable by light-draught steamers. Boats may be procured or built at the head of the lake, but in some respects the most advantageous method is to start early enough to travel on the ice as far as the foot of Lake Lebarge, where timber for boat-building is abundant, as in this way the dangerous passage of the White Horse rapids is avoided. Lake Bennett is 26 miles in length, narrow and canyon-like in form, and deep at the lower end. Fifteen miles below the bend, where the southwest arm comes in, strong winds often prevail, producing a rough sea that is dangerous for boats, and parties are often storm-bound there for several days. A sluggish stream, 2½ miles long and often not more than three feet deep, known as Caribou crossing, extends from the foot of Lake Bennett to Tagish lake. Thence there is clear sailing 19 miles down Tagish lake and five miles along a river deep enough for ordinary river steamers to Marsh or Mud lake. Marsh lake is 19 miles long and empties into Fiftymile river, whose current averages three to four miles an

SUMMIT OF CHILKOOT PASS — CAMP OF CANADIAN MOUNTED POLICE — FEBRUARY, 1898

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hour. About 25 miles down, the river enters Miles canyon, a chasm about 100 feet wide and five-eighths of a mile long, between perpendicular walls of basalt 80 to 100 feet high. The swift, turbulent current carries a boat through this canyon in about three minutes. For a fair-sized boat, not too heavily loaded, which is kept under steerageway by one or more good oarsmen and follows the middle of the stream, so as not to be dashed against the steep rocks on either side, the passage is quite practicable. At the foot of the canyon one must keep to the left until the heavy swells are passed, then turn sharply to the right and land on the east or right bank. A safer course, which is followed by many, is to portage one's load along the right side of the canyon, over a hill about 200 feet high, and run the boat through empty.

Three-eighths of a mile below this canyon are rapids about half a mile long, which, though very rough, are not dangerous. A half-mile below these are the White Horse rapids, the most dangerous on the whole river. They are about one-third of a mile long and are confined between low basaltic walls. Near their foot the walls close together, forming a chasm only 30 yards wide, while the bed of the stream drops suddenly, so that the river rushes wildly through, leaping and foaming in a cataract. Many boats have passed successfully through, but others have been swamped, with loss of outfits and sometimes of life. The safer plan is to portage around the rapids and let the boat down by line. The portage is on the west shore, but on either side a tramway could be constructed without great difficulty.

Lake Lebarge, which is 60 miles below the White Horse rapids, is 31 miles long and easily navigable by steamers. There is abundant good timber at its foot. The river below Lake Lebarge, as far as Fort Selkirk, is known as the Lewes, and is also navigable for 160 miles, down to the Five Finger rapids. Here a rock of conglomerate rises up from the river bottom, forming several islands and backing up the river a foot or two, so as to produce a strong swell below. Steep cliffs of the same rock on either bank render a portage at this point impracticable. With proper steerageway and care, however, an ordinary boat may run the rapids safely. The right or east side is followed by most Yukon travelers, but Ogilvie, of the Canadian Survey, from actual experience pronounces the channel along the west bank as also passable. For six miles below the Five Finger rapids the current is swift, and then occur the Rink rapids,

which extend halfway across the river from the western bank, producing a decided riffle. On the east side, however, the water is comparatively smooth and safe. Below this the river is practically free from rapids and navigation is unimpeded. Fort Selkirk, where the Pelly and Lewes unite to form the Yukon, is 65 miles below. Thence it is about 95 miles to the mouth of White river, 10 miles further to the mouth of the Stewart, thence 22 miles to Sixtymile river, and 45 miles further to Dawson, at the mouth of the Klondike.

Dalton or Chilkat Pass route.—This is an overland route following a direct course, more or less independent of waterways, from the head of Chilkat inlet to Fort Selkirk. It has been used by J. Dalton, a trader, for some time as a pack-train route and for driving in cattle, but little is definitely known of its geography. It ascends first the Chilkat and Klahoela rivers, crossing the pass in 45 miles at an elevation of 3,000 feet and thence descending into the drainage of the Tahkeena river at Lake Arkell. From Lake Arkell the trail is said to pass over an undulating plain, well timbered in the valleys and with grass on the slopes. The distances from the head of the inlet are given as 75 miles to the watershed and 100 miles to Dalton's trading-post; from there to the Pelly the distance is 200 miles, or 300 miles in all to the Pelly, and 350 to 400 to Fort Selkirk.

The Stikine route.—By this route one travels by boat from Fort Wrangell 150 miles up the Stikine river to Telegraph creek, and thence, a little to the west of north, 150 miles to the head of Teslin lake. The ascent of the Stikine river is tedious and sometimes dangerous, the current being swift and rapids numerous. It is, however, the route that was followed in former days by miners going to the Cassiar district. From Telegraph creek to Teslin lake the trail is said to pass through a gently undulating and well-timbered country which presents no obstacles to the building of a railroad. Lake Teslin is said to be about 80 miles long and bounded on both sides by high mountains. From its foot down to the Lewes runs the Teslin river, which is navigable except for two small rapids, one near its head, the other further down. In its lower course the Teslin spreads out into many channels, occupying a total width of two or more miles. This route appears promising, but is as yet only prospective.

The Taku route.—This route ascends the Taku inlet and river and crosses directly to Lake Teslin or Aklen, a distance of 185 miles from Juneau. Thence it is identical with the Stikine route.

By this route one travels by steamer from Juneau 18 miles up the Taku inlet to the foot of a large glacier, which is often very dangerous to boats, even at a distance of several miles, by reason of the ice masses that break off from it; then by boat 60 miles up the Taku river to the head of canoe navigation. The portage which follows is for the first 20 miles through the canyon-like valley of an eastern branch, then for 50 miles in broad valleys of the upper Taku, 3,500 to 5,000 feet above sea-level. For the last 15 miles the route is in the densely wooded valleys of Teslin lake, among many small ponds. This route is said to be not impracticable for a railroad, and a charter for one has already been granted by the Canadian government. Its merits, however, have not yet been thoroughly tested. Both this and the Stikine route have the undoubted advantage of avoiding the dangerous White Horse rapids.

The Copper River route.—This, the only land route within American territory, would strike inland from near the mouth of the Copper river and follow a general northeasterly course toward the Klondike, thus crossing a great mountain range whose rough topography and many glaciers that fill the valleys and passes render general travel difficult. Orca, the only settlement on the coast near by, which is 50 miles beyond the mouth of Copper river and 700 miles from Sitka, had in 1897 a population of 22 whites; it is the first post-office west of Sitka. According to reports of natives, confirmed by Lieutenant Allen, who crossed over to the Tanana in 1885, the better way is to start inland from Valdes inlet, on Prince William sound, and, crossing the Valdes glacier, strike Copper river 180 miles above its mouth, thus avoiding the gorge and the most dangerous rapids. From the Copper River basin an advisable route would seem to be over the Scoloi pass and down White river; but from observations made by Hayes it appears that the pass, which has an elevation of over 5,000 feet, is occupied by a glacier 300 to 400 feet thick, and that White river abounds in rapids too rough for a loaded boat. I. C. Russell, who visited the Mount St Elias region in 1890 and 1891, reports a mountainous region to the northward occupied by huge glaciers. This region is to be explored during the coming summer by parties sent out by the War Department.

GEOLOGICAL SKETCH

Original or Vein Deposits

At present, so far as known, it is only in the coastal region that deep mining is being carried on in gold-bearing veins. Here it

has become a well-established industry, and many large quartz mills are running on the ore extracted from these veins. The principal deposits of southeast Alaska are found in a belt somewhat over 100 miles in length on the seaward slope of the mainland, reaching from Sumdum on the southeast past Juneau to Berners bay near Seward on the northwest. This belt may be also considered to include the deposits on Admiralty and other interior islands. A second belt, further west, is represented by the deposits on the western side of Baranof island, not far from Sitka. The ores, though not always exceptionally rich, are worked at a good profit because of the natural facilities of the region for cheap reduction. The most notable instance of this is the great Alaska-Treadwell mine, which has extracted over seven million dollars' worth of gold from an ore carrying $3.20 a ton, which is worked at an average cost of $1.35. Such conditions can not be expected to obtain in the interior.

These deposits occur in metamorphic slates, diabases, and granites, all similar to the rocks of the auriferous belt of California, and probably, like those, they are of post-Jurassic age. Owing to the dense covering of living and fallen forest trees in this region, prospecting is extremely difficult, and it is probable that future exploration will prove the extent of these gold belts to be much greater than at present appears. The gold-bearing beach sands from Lituya bay to Yakutat bay, along the west foot of the St Elias range, and the placers at the head of Cook inlet, around Turnagain arm and on the Kaknu river, may have been derived from the wearing down of rocks of similar age and composition in the St Elias range and on the Kenai peninsula.

At Uyak bay, on Kadiak island, gold deposits in slates are being worked, and the gold-bearing beach sands of the western end of that island and at Portage bay and the Ayakulik river on the neighboring mainland are apparently derived from metamorphic slates associated with granite, so that it is possible that these more recent gold-bearing rocks extend that far westward. On Unga island, of the Shumagin group, still further west, gold occurs in eruptive andesites of Tertiary age, and mines have been opened on these deposits, the most important of which is the Apollo, one of the most successful in the province. As the Alaska peninsula and the Aleutian islands are largely made up of recent eruptive rocks, this is an important indication, showing the possibility of the occurrence of valuable deposits in such rocks.

In the Yukon basin the gold, so far as known at present, is de-

rived from a much older series of rocks, for the gold-bearing slates of the coastal region have not yet been recognized there. While the exact age of these gold-bearing rocks has not yet been determined, they are known to be older than the limestones supposed to represent the Carboniferous and Devonian formations of the cordilleran system; hence they are probably pre-Paleozoic, and in part are possibly as old as the Archean. The grounds for assuming this derivation are that these rocks contain abundant auriferous quartz veins, and that the richest placers thus far discovered are so situated that they must have been derived from them. These rocks are classified by Spurr as follows, commencing at the base:

Basal granite-schist.—This, so far as known, is the fundamental rock formation of the region. The granite has characteristically a somewhat schistose or gneissic structure, thus showing evidence of having been subjected to dynamic action or intense compression, and it may pass into a gneiss, or even a mica-schist, where this action has been most energetic. On the other hand, it is sometimes massive, showing no parallel structure planes, and then is with difficulty distinguishable from the massive younger granites, which are also of frequent occurrence in the region in the form of dikes and intrusive masses cutting across older rocks. As distinguished from the granites of the coastal region, which are intrusive, these older granites are generally of reddish color and crumbly nature, while the later ones are dark gray from the abundance of hornblende as a constituent mineral.

Birch Creek series.—Resting upon the fundamental granite is a series of rocks, roughly estimated as possibly 25,000 feet in thickness, named the Birch creek series, from the place of their typical occurrence. They consist mainly of quartzitic rocks, generally thin-bedded or schistose, so that they pass into mica-schists; in some places they contain carbonaceous matter and develop graphitic schists. There are also bands which probably originated as intrusive rocks, but which by compression have become schistose like the other members. These rocks have abundant quartz veins; they are generally parallel to the schistosity or bedding, small and not persistent, but some cross the bedding and are then wider. They carry gold with abundant pyrites, and sometimes galena. They are often broken and faulted.

Fortymile series.—Younger than the Birch creek series, but in general closely associated therewith, is another thick series of

rocks, called the Fortymile series, because of their development on Fortymile creek. They are characterized by alternations of beds of marble, from a few inches up to 50 feet in thickness, with quartzitic and other schists, which may be micaceous, hornblendic, or garnetiferous, and sometimes graphitic. They are traversed by abundant dikes of eruptive rock, mostly granites and diorites. Two sets of quartz veins are developed in these rocks: (1) an older set, which are generally parallel to the schistosity or lamination, like those in the Birch creek series, and like them are broken by later movements and carry pyrite and occasionally galena; (2) a set of larger veins, which form an apparent transition from dikes of aplite, a rock consisting of quartz and feldspar. They cut across the bedding and are not disturbed by later rock movements, hence are younger in age.

Rampart series.—This still later series is primarily distinguished from the preceding by the darker color of its rocks, which are dark green when fresh and become a dark red by weathering. They consist largely of basic eruptive materials, beds of diabase and tuffaceous sediments, with hard green shales and some limestones containing glauconite, or green silicate of iron. They also contain novaculites, or fine-grained quartzitic slates, and jasperoids, or iron-stained quartzose rocks. Serpentine and chlorite, noticeable by their softness and green color, are frequent alteration products. These rocks also contain a few quartz and calcite veins, which are generally developed along shear zones, or places where by rock movement and compression a series of closely appressed parallel fractures are developed. The basic character of these rocks and their large content of pyrite seem favorable to the concentration of ore deposits; they present, moreover, certain analogies, both in composition and in geologic position, with the copper-bearing rocks of Lake Superior. But the observed veins are younger than the joints and shear planes, which were probably produced by the rock movements that crushed the veins of the older series, and assays of their ores have as yet shown but insignificant amounts of gold and silver. These veins, as well as those in the granite, are, moreover, much less abundant than those in the Birch creek and Fortymile series; hence it is thought that the latter are probably the principal source of gold in the placers.

The younger rock series noted are, briefly, the following:

Tahkandit series.—This consists of limestones, sometimes white and crystalline, generally green or black, alternating with shales.

In certain localities, notably on the Tahkandit river, it has conglomerates carrying greenish pebbles supposed to be derived from the rocks of the Rampart series. In the beds of this series have been found fossils of Carboniferous age and plants of Devonian aspect.

Mission Creek series.—Later than the Tahkandit series, but, like it, not very well defined, is the Mission creek series, consisting of shales and thin-bedded limestones with gray sandstones. Locally there are thin beds of impure lignite and at the base a conglomerate ("cement rock" of the miners) containing pebbles not completely rounded derived from older rocks in the neighborhood, which sometimes carries gold. The beds of this series are sometimes altered and sharply upturned and folded, but generally have a rather fresh appearance. In the neighborhood of shear zones they are impregnated with pyrite and carry small quartz veins. The limited exploration of these rocks has developed no important deposits of mineral. The age of the beds is as yet uncertain, but they are in part as late as Cretaceous.

Kenai series.—Next above the Mission creek rocks, and not always readily distinguishable from them, is a great thickness of rather loosely consolidated conglomerates, shales, and sandstones, generally greenish in color, which are the coal-bearing rocks of the region; they everywhere contain plant remains and rest unconformably upon the older rocks. They have, however, been folded to a certain extent, and stand upturned at angles of 20° to 60°. They are supposed to be of Eocene-Tertiary age.

Later Tertiary beds.—Other and more recent Tertiary beds have been observed generally in the more open country of the Lower Yukon, which have little economic importance, though they sometimes contain thin lignitic seams. They are variously known from the localities where they have been observed, as the Nulato sandstones and the Twelvemile and Porcupine beds, the two last named being assumed to belong to the same series.

The more recent formations, silts and gravels, will be considered under the heading "Detrital or placer deposits."

DISTRIBUTION OF GOLD-BEARING ROCK FORMATIONS

The most definite facts with regard to the occurrence of the gold-bearing formations, the Birch creek, Fortymile, and Rampart series described above, were obtained by the reconnaissance made by members of the United States Geological Survey in the summer of 1896, under the charge of J. E. Spurr, in the Amer-

ican portion of the Yukon district, and the exposures of these rocks as shown on the maps of his report have been indicated in colors on the accompanying map. Data gathered by earlier geologists, notably those of the Canadian Survey and of C. W. Hayes and I. C. Russell, of the United States Geological Survey, have provided suggestions as to the extent of these rocks in outside areas, but the reader need only bear in mind the enormous area, the difficulties of exploration, and the want of accurate maps of the region, to realize that generalization must as yet be very tentative and liable to future change.

As shown by the map, the belt in which these rocks have been found extends about 500 miles in a general northwest-southeast direction, but there are indications that the actual extent of these exposures may be twice as great.

The best-known exposures of these rocks occur along the northeastern flanks of a broad belt of fundamental granites and crystalline schists, which apparently form the central nucleus or backbone upon which they rest. This belt is known in a general way to extend up the Tanana river from near its mouth southeastward across the White river below the Donjek. In the latter region C. W. Hayes reports quartzites and limestones resembling the Birch creek and Fortymile series on the southern flanks of the granite, but the width of the belt, and whether there is any considerable extent of the gold-bearing formations along its southern flanks, is as yet unknown. It may not improbably extend into the high range south of Tanana, of which Mount McKinley is the culminating point and in which the Kuskokwim and Sushitna rivers of western Alaska take their rise, for from the reports of Moravian missionaries and of the traveler Dickey it appears that gold occurs in the sands of each of these streams. To the westward the granite backbone appears to pitch gently downward, as its surface area narrows, and no exposures are known west of the Yukon river. It is probably not a continuous mass of granite on the surface, but contains smaller areas of the later rocks folded in with it. East of the international boundary the area in which the granite occurs apparently widens, but its exposures are less continuous, the overlying rocks not yet having been worn away. One granitic axis appears to extend eastward from the Fortymile district through the Klondike region in a nearly east-west direction, which is that of the prevailing strike of the sedimentary rocks. The Canadian geologists report a second granite axis on the Dease

river just below Dease lake, which may belong to the older granites, though they do not make the same distinction that Spurr does between the older granites and the later intrusive rocks.

Rocks of the various gold-bearing series above the granite are reported at the following localities: Their first appearance, to one ascending the Yukon from the sea, is near the mouth of the Nowikakat. From here up to the Tanana river, rocks of the Birch creek series outcrop frequently along the river, when not concealed by Tertiary sandstones and conglomerates, and the range of low mountains on the north side and parallel to the river is probably formed of these and Fortymile rocks. About three miles above the mouth of the Tanana, granite is exposed on an island in the Yukon, and 12 miles higher calcareous quartzitic schists of the Fortymile series appear under the Tertiary conglomerates. From the mouth of the Tanana up to Fort Hamlin, at the lower end of the Yukon flats, the river runs in a canyon-like channel, known as the Lower Ramparts, cut through a low range of mountains, which consist principally of the dark greenish and reddish rocks of the Rampart series, except where these are buried under Tertiary conglomerates. The latter rocks occur immediately above the exposures of Fortymile rocks, and again from Mynook creek up beyond the mouth of Hess creek. Higher up on these streams the Rampart rocks come to the surface, and the Fortymile rocks are supposed to be uncovered at their very heads. Between the two areas of Tertiary rocks the Rampart rocks occupy a belt 15 to 20 miles wide along the river, and are cut by great dikes of intrusive granite.

From Fort Hamlin up to near Circle City, a distance, neglecting curves, of about 200 miles, the river flows through a perfectly flat region covered by fine silts and gravels, known as the Yukon flats, in which no outcrops of solid rock have been observed. In the Birch creek district, around the headwaters of Birch creek and southwest of Circle City, the Birch creek series occupy a broad area; their general strike is east and west, curving at either end to the northward, and the prevailing dip is between 5° and 30° to the south. There is, however, evidence of a northern dip as well, and the Fortymile schists and marbles rest upon them along the trail to Circle City. Marbles, probably belonging to the Fortymile series, are also reported in the hills between Birch creek and the Tanana to the southward.

At the crossing of Birch creek by the trail from Circle City and

along the Yukon river for 30 or 40 miles above the Yukon flats, rocks with the characteristic dark coloring of the Rampart series are exposed. From these up to the mouth of Mission creek rocks of the Tahkandit, Mission creek, and Kenai series occupy the banks of the river. On Mission creek itself only these later formations are found, but the gold in the gravels is supposed to come from the conglomerates ("cement rock") of the Mission creek series, which contain pebbles of the older rocks. On American creek, the main branch of Mission creek which comes in from the south, the dark rocks, shales, limestones, and tuffaceous beds which form the bed-rock are supposed to belong to the Rampart series, which also occur along the Yukon river from five to ten miles above Mission creek to within 25 miles of the mouth of Fortymile creek. Above this to some distance above Fortymile creek the river runs in beds of the Mission creek series.

It is in the Fortymile district and the adjoining mining district, on tributaries of Sixtymile creek, that the relations of the different gold-bearing series are best seen. Here there is an east-west axis or backbone running parallel to the upper part of Fortymile creek and along the divide between it and Sixtymile creek, with quartzite schists of the Birch creek series resting immediately on it, both to the north and to the south. Above these, on either side, are the marbles and alternating schists of the Fortymile series. Fortymile creek below the forks runs for a considerable part of its course along the junction between these two series, on the northern flank of the anticline. Dikes of various eruptive rocks, including intrusive granite, are very abundant, especially on the South fork. On the upper part of this fork are green tuffs and slates of the Rampart series, overlain unconformably by conglomerates, sandstones, and coaly shales of the Mission creek series. Both the South fork and Sixtymile creek are supposed to head in a backbone of granite around Sixtymile butte, which is surrounded by quartzite schists of the Birch creek series. These regions lie partly in American, partly in Canadian territory.

The Canadian area has not been studied by American geologists, except in wayside observation along such routes of travel as necessarily lay through it. The Canadian geologists, on the other hand, did not in their earlier and published observations recognize any subdivisions in the older rocks such as have been made by Spurr. Hence it is not possible to attempt even a proximate outline of the Canadian gold-bearing rock formations. General geological data and local discoveries of gold-bearing

gravels indicate that the gold-bearing area is very large, and may be roughly defined as reaching from Dease river to the boundary, with a width of 200 to 300 miles or more. The recent enormously rich discoveries have, however, been confined to a more limited area around the Klondike and Stewart river districts, over which it has been possible to extend, with a reasonable degree of probability, the colors indicated on the map for adjoining American areas. Thus it is assumed that the east-west uplift of fundamental granite and overlying rocks extends eastward into the Klondike district, and that a second uplift in a southeasterly direction extends from upper Fortymile creek toward the valley of Stewart river.

Spurr noted outcrops of the schistose quartzites of the Birch creek series for a large part of the distance from the mouth of Fortymile creek up to the junction of the Pelly and the Lewes at Fort Selkirk; also granites at various points, in some cases schistose like the fundamental granite, in others fresh and massive like intrusive granite. There were also occasional belts of marble belonging to the Fortymile series, notably one five or six miles above the mouth of Sixtymile creek, not far from that of Stewart river. These observations afford a rough section across the belt of crystalline schists mentioned by the Canadian geologists as stretching eastward and southeastward along the upper Pelly and adjoining streams and across to the Frances river. Along the eastern edge of the crystalline belt they also recognized rocks of a general greenish color, made up largely of altered volcanic rocks, which would answer to the description of the Rampart series. Similar rocks were also noted at various points on the Lewes above its junction with the Pelly, notably in the Seminow hills near the Big Salmon river, which may represent the development of the Rampart series on the south flanks of the crystalline belt.

PLACER OR DETRITAL DEPOSITS

The extraordinarily rich placer deposits of the gulches tributary to the Klondike river above Dawson, and of similar gulches of the nearby Indian creek and Stewart river, have been so recently opened that no detailed geological description of these localities has yet been received. In his report, however, Spurr had shown that the strike of the gold-bearing rocks in the Fortymile district and the exposures observed along the Yukon indicated that their gold must have been derived from the same

gold-bearing formations that had furnished the richest placers in the districts visited by him. A brief statement of the prominent characteristics of these districts as given by him will therefore probably be of value.

The hills surrounding the gulches of the Little Mynook and Hunter creeks, on the Lower Yukon, are formed of rocks of the Rampart series. The bed-rocks are of diabase, tuffs, impure shales, and quartzites, and in the bottoms of the gulches there is from 10 to 20 feet of gravel. The gravel consists in part of angular fragments of rocks that form the walls of the gulch, in part of waterworn pebbles of Birch creek schist, schistose granite, and other rocks. The gold is generally in rounded, bean-shaped grains and nuggets, and less frequently in unworn particles. This points to a two-fold origin of the gold, as derived in part from the rocks immediately about and in part from distant and older rocks, which may have been worn down, possibly along an old seashore, into terrace gravels, and then by subsequent erosion brought into the present stream beds. Further exploration in the hills to the south may disclose the true source of these pebbles and of the gold that accompanies them. On American creek, in the Mission creek district, the gold-bearing placers are also derived from rocks of the Rampart series—quartzitic schists, serpentines, and chloritic rocks—and the gold is said by Spurr to have been derived mainly from the schistose zones in the bed-rock.

The richest gravels have been found in the Birch creek and Fortymile districts. In the entire Birch creek district, which lies south of Circle City, and on Miller, Glacier, Poker, and Davis creeks of the Fortymile district, near the international boundary, the bed-rocks are always the quartzite-schists of the Birch creek series, containing veins of quartz. The gravels rest, as a rule, directly on the schist, though in some cases, as on Harrison and Eagle creeks, in the Birch creek district, there is clay beneath the gravels, and the gold, as a rule, does not extend into the bed-rock, but occurs chiefly at the top of the clay. Generally, however, the schist is rotted and reddened from oxidation for a few inches to several feet below the surface, and in this part the gold has settled into the cracks and joints. The pay gravels lie mostly next the bed-rock, in an average thickness of perhaps two feet, though sometimes up to ten feet, while the overlying gravels average eight or ten feet, with a maximum of 25 feet. In the gravels the schist is in quite large, flat fragments, and the

quartz is in bowlders of varying size. The schist fragments lie flat, and are mixed with sand, showing that the sorting action of running water has not been carried far. In the concentrates from the sluice-boxes the heavier minerals associated with the gold—galena, magnetite, limonite, hornblende, and garnet—are in each case such as are found in the neighboring schists, and the nuggets of gold often have pieces of quartz still adhering to them. All these facts are evidence that the gold is derived from rocks in the vicinity and is not brought from a great distance, perhaps by glaciers, as some erroneously suppose.

The rocks of the Fortymile series in the Fortymile district, as already stated, form the west bank of Fortymile creek, and south of the South fork cross the divide between Franklin gulch and Napoleon creek, where they are overlain by green slates of the Rampart series, which in turn are overlain by conglomerates of the Mission creek series. In Franklin creek the bed-rocks are marbles interbedded with mica and hornblende schists; the gravel contains fragments of marble, quartzite, mica-schists, and vein quartz. At one point a quartz vein is found in the bed-rock, and below it native silver has been found in the gravels, which apparently came from this vein. It is the schistose rocks that mostly carry the gold, as the marbles do not show much evidence of veins. In this gulch are two levels; the higher one, at the head of the gulch, had not been worked, while the pay gold had been found mainly at the lower level, near the mouth of the gulch.

Chicken creek, so called because its gold occurs in grains the size of chicken feed, drains a wide area toward the Ketchumstock hills to the southwest, and the actual source of the gold is less readily defined. The gravel contains fragments of granite, quartzite, schist, and marble.

On Napoleon creek conglomerate forms the bed-rock near the mouth. The gravels contain fragments of quartzite, vein quartz, hornblende-granite, and various eruptive rocks, and the source of the gold is assumed to be the conglomerate, which is made up of fragments of the older rocks, for the rocks higher up the gulch above the conglomerates have not been found to carry much gold.

The most trustworthy reports from the Klondike region indicate that the exceptionally rich placer gravels thus far found occur in side valleys entering the main Klondike valley from the south, such as Bonanza, Eldorado, and Hunker creeks, and in some gulches across the divide tributary to Indian or Stewart rivers. No gold in paying quantities had been found on the

Klondike itself. The placer deposit generally consists of 10 to 15 feet of frozen muck and decayed vegetation at the surface, then a gravel bed that rarely pays; below that a clay selvage, under which is pay dirt, from one to five feet in thickness, resting on the upturned edges of the schist, from which it is separated by a clay selvage. The pay streak or bottom of the old channel is usually very regular and straight, not following the bends of the present stream; it is said to average 60 cents to the pan, and may yield $1 to $3. Only very exceptionally rich gravel can be worked at all under present conditions.

Other detrital deposits.—Besides the placer gravels above described, there are other detrital deposits that may carry gold, some of which are known to occur in the Yukon district, but have not as yet been extensively worked. In the larger streams accumulations of gravel and sand are made in places of slackening current, such as the inner side of curves, or at points where considerable coarse material is brought into the main stream by more rapid tributaries; such accumulations are called "*bars*," and often contain much gold. In some cases the entire mass of sand and gravel in a river bed contains enough gold to be worked at a profit by mechanical processes. There must necessarily be a large amount of gold in the bars of the Yukon and its tributaries, but whether they are rich enough to be profitably worked under existing conditions has not yet been proved.

Another common form of detrital deposit is the fine "*silts*," which often cover wide areas. The most notable instance is what is called the Yukon flats, which extend for a hundred miles or more above and below the great bend of the river at Fort Yukon and a considerable distance up the Porcupine, thus covering an area perhaps 100 by 200 miles in extent. Similar flats, but of more moderate dimensions, occur at various points along the lower course of the river, generally in the concave sides of curves. These silts are being deposited at the present day in the annual floods when the river waters cover such wide areas that their movement becomes as sluggish as those of a lake. There are, however, similar beds of silt of like appearance and constitution at altitudes of several hundred feet above the present stream, which are of widespread occurrence not only in the lower Yukon country but in the plateau region of British Columbia. The latter have been designated white silts by Dr Dawson, who considers that they were laid down in fiords connecting with the sea, their material being furnished by the grinding of the re-

treating cordilleran glacier. These ancient silts and the benches or terraces that fringe the mountains all over the interior of Alaska up to 3,000 feet above the present sea-level point to a comparatively recent submergence of the country to this amount. The American geologists are inclined, however, to attribute a lacustrine origin to part at least of these silts. The absence of marine fossils in them is admitted by Dr Dawson to be negative evidence against their marine origin. From an economic point of view, these silts are of little importance, however, as the gold contained in them would be so finely divided that it probably could not be extracted at a profit.

It is otherwise, however, with the *terrace gravels*, which are also very widespread throughout the interior. When these occur at moderate heights above the present streams and evidently represent earlier stages in the cutting down of their valleys, they may naturally be expected and indeed are often found to contain considerable gold, which it may pay to extract. In the Cassiar mining district quite a large proportion of the gold was derived from terrace gravels. The higher terraces, which are not confined to present valleys, but cross divides and sometimes form plateaus, must have been worn down or redistributed by broader bodies of water, which would be less likely to concentrate the gold than river waters. They have already been observed at 1,500 feet elevation, and if the hypothesis of submergence expressed above is correct, should be found up to 3,000 feet; they are probably of little economic importance.

Ancient river gravels that have been protected from erosion by a covering of recent lava have not yet been noted in the Yukon valley, though recent flows of basaltic lava occur at various points from the lake region of the Lewes river down to St Michael island, 60 miles north of the mouth of the Yukon. In the Upper Stikine valley such an old river channel, in which auriferous gravels had been protected by a recent flow of basalt, is cut through by the modern stream and has caused a notable enrichment of its bars immediately below. It is a question, however, whether modern erosion in the Yukon valley is sufficiently deep and active to expose such channels if they do exist there.

Another source of gold, which occupies an intermediate position between original and detrital deposits, is what is generally known as *fossil placers* or conglomerate beds, within a geological rock formation which is made up of material resulting from the wearing down, generally on an old shore line, of older gold-bear-

ing rocks. Such conglomerates have been observed in both the Mission creek and Kenai series of beds, and if future study shows them to have been formed under favorable conditions they may prove to be an important source of gold. According to Mr Spurr's observation, the modern placers of Napoleon creek in the Forty-mile district, have been enriched by gold derived from the basal conglomerate of the Mission creek series, which is made up of materials derived from the Birch creek, Fortymile, and Rampart series.

PROBABLE EXTENT OF GOLD-BEARING DEPOSITS

In a new country gold is first sought in the stream gravels, and thence traced up to its source. Very fine gold may be carried long distances by river waters; hence it is only when it becomes relatively coarse, or at any rate carries coarse particles, that the source may be considered necessarily near at hand. Fine gold is found in almost all the rivers of Alaska, even the silts of the Yukon yield it in places. Gold has been found along the whole length of the Lewes, the Teslin, the Big Salmon, the Pelly, the Stewart, and the Selwyn, and on the Yukon river almost continuously from the junction of the Lewes and Pelly downward. Still further east, Frances and Dease rivers, the main branches of Liard river, which flows into the Mackenzie, carry gold. In the Cassiar district, on the Dease river, gold was discovered as early as 1861. The district was actively worked as a placer camp from 1873 to 1887, during which time it yielded about five million dollars' worth of gold dust. These upper regions are distant about 1,000 miles in a straight line from the known outcrops of gold-bearing rocks in the Rampart mountains on the Lower Yukon, and are within areas either in which exposures of the gold-bearing rocks as defined above are actually known to exist or in which the similar lithological character of rocks described renders it probable that in some part of the area they may be exposed.

There is also some evidence of the extension of rocks of the gold-bearing series to the northwest of the Lower Yukon, though it is as yet impossible to determine whether the primitive gold-bearing rocks of the Birch creek and Fortymile series there come to the surface, or whether it is simply the fossil placers or gold-bearing conglomerates of later formations, where made up of fragments of these older rocks, that have furnished the gold of modern streams.

In this region gold has been found extensively along the Koyukuk, and most abundantly, as already mentioned, where the valley cuts through conglomerates supposed to belong to the Kenai series. This is at the forks, about 300 miles above the mouth, below which the country is low and swampy; above the forks the mountains close in and the sides of the valleys become precipitous. The gold in the bars is said to be coarse, suggesting nearness to the source, and has yielded as much as $100 per day by use of the rocker. Prospectors are said to have explored to considerable distances above the forks, up to 500 miles from the mouth, and to have recognized rocks similar to those of the Birch creek and Fortymile districts. This, if true, is important as an indication of still further extensions of the area of exposures of the older gold-bearing rocks.

Further east, at the head of Dall river, low, broken hills, apparently composed of schists and quartzose rocks, extend northeastward to the Romanzof mountains. The latter are snow-covered in summer, and form the northern boundary of a low plain that lies to the north of Porcupine river; these mountains are likewise said to be made up of metamorphic schist and quartzites.

Still further northwest, in the country to the northeast of Kotzebue sound, gold has been reported from the Kowak and Noatak rivers. It is possible that the older series of rocks is exposed in the mountains of this region, but more probable that the gold is derived from the conglomerates of the Mission creek series, which, as already shown, afford gold on Napoleon creek and in the Mission creek district.

Gold is also reported by prospectors from a belt of country which is generally parallel to the known gold belt, but set off to the southwest and which corresponds to the supposed southwestern flank of the granite backbone. Such discoveries have been reported from Fish creek, which flows into Norton sound north of St Michael, and from the upper Kuskokwim river, which flows into Bering sea. On the Sushitna river, which flows into Cook inlet, W. A. Dickey reports colors of fine gold in the sands all along the stream, and platinum on the upper river, where veins of white quartz carrying gold, silver, and copper were found in slates associated with granite and porphyry. Gold and copper have been reported by various persons from the region about the sources of the Copper and White rivers. It is thus evident that the elevated region along the heads of these various streams, and

between them and the waters of the Tanana, possesses great possibilities in the way of mineral development, but from all accounts it is a region exceptionally difficult of access, and it may well be questioned whether it is advisable to attempt its exploration until facilities for travel and obtaining supplies in the Yukon region have been increased, as they will be in the near future.

More accessible is the region immediately north of the Tanana river known as the Tanana hills and Ketchumstock hills, which from reports appears to be mainly a granite region, but in which it is likely that outliers or patches of the gold-bearing schists will be found inclosed within the granite area.

Late reports by prospectors in the Tanana region state that the river has slack water, navigable for steamers 150 to 200 miles above its mouth; above that the current is swift. Mountains border the river on the north side from the mouth up, on the south they are far distant. Colors are found in all the creeks; those heading toward Fortymile and Seventymile offer best promises, but no important prospects have been found. Toward Circle City the creeks do not freeze up, and a hot spring was found in one of the gulches.

In the mountain region to the northeast of the Yukon river immediately above the bend, such observations as have been made do not offer much promise of exposures of the older gold-bearing schists. Older limestones occur there, but, though important gold deposits are known to occur in limestones, in the Yukon country the general rule appears to prevail that gold is concentrated mainly in the siliceous rocks. It may well be, however, that in the conglomerate or cement deposits of the coal-bearing formations that are known to occur in this northeastern region there are portions sufficiently rich in gold to make paying placers by their wearing down. In searching for such places the prospector should study the character of the pebbles that make up the conglomerate; it is only when these include fragments of the gold-bearing rocks and occasionally of vein quartz that they are likely to be productive.

For the region east of the international boundary, Spurr had already pointed out, as a result of his observations in the summer of 1896, that the Klondike and Indian creek regions were likely to show rich placers, because the schists of the Birch creek series, and to some extent the marbles of the Fortymile series, formed the bed-rock.

George M. Dawson reports bars of fairly coarse gold on the

Pelly all the way up to Hoole river. Just below the mouth of the McMillan the river has cut a canyon through gray granite hills, below which are dark crystalline schists with east-west strike and northerly dip, associated with which are alternating marbles and chloritic schists, probably of the Fortymile series. Granite occurs again near the junction with the Lewes. Of the valley of the McMillan nothing was known. The Pelly above the detour or bend had a similar series of quartzite schists, with interbedded limestones on the north, while the Glenlyon hills to the south were of granites. Above these are sandstones supposed to belong to the coal-bearing series and dipping 45° S. Still higher up in Hoole canyon are marbles again, associated with schists and volcanic rocks, possibly of the Rampart series. Still further northeast, in the middle canyon of the Frances river, Dawson found marbles again, while in the Tootsha range to the east were seen granites and schists with abundant quartz veins.

All along the summit of the Coast range the prevailing rocks are granites, cut by later porphyry dikes. They form a belt 20 to 80 miles wide, and are generally of the hornblende or intrusive type. On the Dyea and Skagway trails they extend down on the northeast side to the mid-length of Lake Bennett. In the range of hills between Miles canyon and the Teslin river are diabasic or dark eruptive rocks and limestones, which may belong to the Rampart series, though Dawson considers the limestones to be probably Carboniferous.

Along the region of Rink and Five Finger rapids, below the Big Salmon, are infolded masses of Cretaceous rocks (Kenai?) with conglomerate at the base, overlain in places by lavas. Below these are greenish eruptive rocks, and then near the mouth of the Pelly is granite again, succeeded below the Pelly by basalt flows. Twenty-five miles below the Pelly granitic rocks again appear, and are succeeded by crystalline schists of various kinds, which constitute the prevailing rock down nearly to Fortymile.

COAL AND LIGNITE

Coastal Region

The coal of Alaska so far examined, whether in the interior or on the seacoast south of Bering strait, is of Eocene or early Tertiary age and belongs without exception to varieties of lignite, brown coal, or glance coal. North of Bering strait, in the vicin-

ity of Cape Lisburne, is a coal field of considerable extent containing a fuel which is believed to be of greater geological age, perhaps similar to that so extensively mined at Nanaimo and other points in British Columbia. As rocks of Carboniferous age occur in close proximity to this coal, it was long supposed to belong to the Paleozoic coal measures, like that of Pennsylvania, but an examination of the fossil plants actually associated with it has shown this opinion to be erroneous.

The various coals of Alaska occur in beds interstratified with sandstone, shale, conglomerate, and clay, these rocks usually containing numerous fossil plants, leaves, cones, and amber derived from the fossilization of resin from the ancient coniferous forests. The geological formation containing the coal and leaf-bearing shales is called the Kenai formation, and is usually covered by beds of sandstone containing fossil oysters and other shells belonging to the Miocene or middle Tertiary.

Like all Tertiary coals, the Alaska mineral is light in proportion to its bulk, burns rapidly with little smoke, and has a tendency to break up into small pieces under the action of the weather. The glance coal is brilliant and clean to handle, like anthracite, for which it is often mistaken, but which, bulk for bulk, is considerably heavier. The brown coal gives a brown instead of a black streak when scratched, has the appearance of fossil wood, and in drying splits up into chip-like pieces. The coal-bearing strata are comparatively widespread both along the coast and in the interior, but as yet but few beds have been actually worked.

In the Alexander archipelago, on Admiralty island, coal seams and leaf-bearing shales crop out at a number of points along the shores of Kootznahoo inlet, and a mine has been opened from which considerable non-coking coal has been extracted at the head of Davis creek, near Killisnoo village, about 40 miles northeast of Sitka.

Coal or coal-bearing strata are also reported on Prince of Wales island, near Kasahan bay; on Lindenberg peninsula of Kupreanof island; on the northeast and also on the west side of Kuiu island; on the southern point and in Seymour canal, on the western side of Admiralty island; at Whale bay, on Baranof island, 23 miles southeast of Sitka, and at various points on Chichagof island, northwest of that place. Similar occurrences are reported at Lituya and Yakutat bays, on the southwest flanks of the St Elias range.

The most important known coal field is on the east shore of Cook inlet, on the Kenai peninsula. Here the coal beds cover an area of 70 by 30 miles and rise in high bluffs 2,000 feet above the sea. At Kachemak bay, where is the only good harbor, there are six or seven seams, the thickest of which is four feet thick. Several shiploads of the coal, which is of fair average quality, have been taken out.

Along either shore of the Alaskan peninsula and on islands adjoining them and in the Aleutian chain for some distance beyond Unalaska coal strata are reported, and have been worked or opened at Amalik harbor, Unga island, and Chignik bay, on the south shore, and at Herendeen bay, on the north shore of the peninsula.

North of the Yukon, coal beds are reported at several points along Norton sound, on the Kowak river, which empties into Kotzebue sound, and on the banks of a river entering into Wainwright inlet, on the Arctic ocean. The Cape Lisburne coal field extends in a general way from Cape Lisburne to Cape Beaufort, a distance of 25 miles; this coal has been extensively used by steam whalers.

In the interior, coal strata have been observed at or near Andreafski, Kaltag, Nulato, and Melozikakat, on the Lower Yukon. Three seams have been mined on the right bank of the Yukon in the Lower Ramparts at Coal creek, and coal has been taken from Coal creek, which enters the Yukon from the north. There is some evidence of a considerable development of coal-bearing strata extending in either direction from this point nearly parallel with the Yukon river and not far north of it. Although these coals are rather light, their proximity to the gold fields promises to render them of considerable industrial importance.

THE CIVIL GOVERNMENT OF ALASKA

By Hon. George C. Perkins, U. S. S.

A bill making provision for the civil government of Alaska is now before Congress and may become a law, but pending its passage the political organization of the Territory is as follows:

The executive head of the territorial government is the governor, appointed by the President. The code of laws of the Territory is that which was in force in the State of Oregon on May

17, 1884, so far as the same may be applicable and not in conflict with the provisions of the act providing a civil government for Alaska or with the laws of the United States. There is a difficulty, however, in the machinery to enforce these laws, as there is only one judge, who holds court at Sitka and Wrangell, in the narrow strip along the coast known as the Panhandle. He is, however, authorized and directed to hold such special sessions as may be necessary at such times and places as he may deem expedient. There are nine commissioners for the Territory, who, under the act of May 17, 1884, exercise all the duties and powers, civil and criminal, now conferred on justices of the peace under the general laws of the State of Oregon. Commissioners are stationed at Unalaska, Kadiak, Circle City, Dyea, St Michael, Unga, Sitka, Juneau, and Wrangell. These commissioners have also probate and *habeas corpus* jurisdiction, and are notaries public and recorders of deeds. There are a marshal and ten deputy marshals, the latter residing at the places mentioned above and Douglas City. They have the powers of constables under the laws of the State of Oregon. There is one district attorney for the district court and one assistant.

The salaries of these officials are as follows:

Governor, $3,000; district attorney, $2,500; marshal, $2,500; district judge, $3,000; clerk, $2,500; commissioners, $1,000, with the usual fees of U. S. commissioners and justices of the peace for Oregon and such fees for recording instruments as are allowed by the laws of the same State; deputy marshals, $750, with the usual fees of constables in Oregon.

Under the Interior Department there are twenty-one Indian police. Under the Treasury Department there are four special agents stationed at the Pribilof, or Seal, islands, in Bering sea, whose duty is to protect the seals from poachers and to see that the specified number of skins to be taken each year is not exceeded. They are stationed at the Pribilof islands. There is also an inspector for the protection of the salmon fisheries of Alaska, with one assistant, whose headquarters are at Sitka, but whose duties take them to the various streams along the coast which the salmon frequent, and on which there are canneries. The customs service includes a collector of customs and two deputies at Sitka, and deputies at Juneau, Mary island, Kadiak, Karluk, Cook inlet, Unga, Unalaska, St Michael, Circle City, and Dyea.

Under the Interior Department there is a general agent of edu-

cation in Alaska, with an assistant general agent and a superintendent for each of the two educational districts. There are twenty-three teachers and an enrollment of 1,267 pupils in 20 day-schools. These schools, with about 20 mission schools and homes conducted by the various missionary organizations of the United States, the most efficient of which is the industrial school at Sitka, with a few schools of the Russo-Greek Church, supported by the Russian government, constitute the educational facilities of Alaska. In Sitka, Juneau, and Douglas separate schools are maintained for white and native children. During 1896 a school-house was erected near the Treadwell gold mine on Douglas island, and in 1897 a new school-house was built at Hoonah, Chichagof island. In September, 1896, a school was opened at Circle City.

The government maintains five herds of reindeer in the territory, namely, one at Cape Prince of Wales, numbering 253, one at Cape Nome, numbering 218, one at the Swedish mission at Golovin bay, and one at the St James' Episcopal station near by, numbering together 206, and the central government herd at the Teller station, numbering 423, making a total of 1,100.

There is a prohibition against bringing liquor into the Territory, but it is evaded by smugglers from Canada and the United States, and at every settlement the numerous saloons seen are evidences of the extent of the smuggling operations.

Annette island, in southeastern Alaska, has been set aside as a reservation for the Metlakatla Indians, who emigrated from British Columbia, and to whom the island was assigned by the act of March 3, 1891. The Secretary of the Interior recommends that citizenship be extended to them.

The great necessity to commerce, in consequence of the rush of gold-seekers to Alaska, of more exact information regarding channels, etc., along the coast, has led the Coast and Geodetic Survey to send out two parties for the purpose of surveying the channels of entrance to the Yukon river and the navigability of the Copper river. The head of Cook's inlet will also be examined. The Geological Survey has also sent men into the Alaska field, for the purpose of examining and reporting upon the mineral resources of the Territory.

A military reservation has been established by the Government at St Michael, in Bering sea, embracing a territory within a hundred miles' radius from the port of St Michael. It takes in a portion of the Alaskan mainland, including the delta of the

Yukon. The policy of the Government is to lease for a nominal sum sufficient area and water frontage for commercial, manufacturing, and shipbuilding purposes. The Government has also a military station near Circle City and another on the Copper river.

Special legislation relating to Alaska has, up to the present time, had reference simply to the narrow strip along the southern coast, known, as stated above, as the Panhandle, and to the Pribilof and Aleutian islands. Its provisions are not sufficiently flexible to permit of its extension to the interior by executive action. There is, however, one exception, wherein the Secretary of the Treasury is authorized to extend the customs laws throughout the Territory.

The laws of the United States relating to mining claims and the rights incident thereto were put in force in Alaska by the act of 1884 and the act of March 3, 1891.

The laws relating to lands and titles are as follows:

The mineral land laws of the United States.

Townsite laws which provide for the incorporation of townsites and acquirement of title thereto from the United States government to the townsite trustees.

The law providing for trade and manufactures, giving each qualified person 160 acres of land in a square and compact form. Applications for townsites and for trade and manufacturing purposes are to be made to the marshal and clerk at Sitka. The coal-land regulations are distinct from the mineral regulations or laws, and the jurisdiction of neither coal laws nor public-land laws extends to Alaska, the territory being expressly excluded by the laws themselves from their operations. The act approved May 17, 1884, providing for civil government in Alaska, has this language as to mines and mining privileges:

"The laws of the United States relating to mining claims and rights incidental thereto shall, on and after the passage of this act, be in full force and effect in said district of Alaska, subject to such regulations as may be made by the Secretary of the Interior and approved by the President, and parties who have located mines or mining privileges there, under the United States laws applicable to the public domain, or have occupied or improved or exercised acts of ownership over such claims, shall not be disturbed therein, but shall be allowed to perfect title by payments provided for."

There is still more general authority.

The act of July 4, 1866, says:

"All valuable mineral deposits in lands belonging to the United States, both surveyed and unsurveyed, are hereby declared to be free and open to exploration and purchase, and lands in which they are found to occupation and purchase by citizens of the United States, and by those who have declared an intention to become such, under the rules prescribed by law and according to local customs or rules of miners in the several mining districts, so far as the same are applicable and not inconsistent with the laws of the United States."

The patenting of mineral lands in Alaska is not a new thing, for that work has been going on all the time.

In 1897 a surveyor-general was specifically provided for by the act of June 24 and an additional land office authorized, but the latter could not be opened, as no appropriation was made for salaries.

By the bill now before Congress, and which will undoubtedly become a law, the homestead land laws are extended over Alaska, subject to such regulations as may be made by the Secretary of the Interior.

The bill provides:

That no indemnity, deficiency, or lieu lands pertaining to any land grant outside of Alaska shall be located within that Territory.

That no entry shall be allowed extending more than forty rods along the shore of any navigable water, and along such shore a space of at least forty rods shall be reserved from entry between such claims.

That nothing within the act shall be so construed as to authorize entries to be made or title acquired to the shore of any navigable waters within the Territory.

That no homestead shall exceed forty acres, unless it be located on meadow land or land chiefly valuable for grazing or agricultural purposes, of which 160 acres may be entered as a homestead under the general land laws of the United States.

That any citizen, association, or corporation may purchase, for purposes of trade, manufacture, or other productive industry, not exceeding forty acres, at $2.50 per acre, such tract not to include mineral or coal lands.

That a right of way 100 feet wide may be granted to duly organized railroad companies, which are also given the right to take from unoccupied public lands adjacent such material as may be necessary in construction, and to purchase not to exceed forty acres of land for terminal facilities and twenty acres for stations, at $1.25 per acre, but the act cannot be construed to give such companies the ownership or use of minerals or coal within the right of way or terminal and station grounds.

That all charges for transportation shall be fixed subject to the approval of the Secretary of the Interior.

That rights of way, 100 feet broad, may be granted for wagon roads, wire-rope, aerial, or other tramways on similar terms.

All affidavits, proofs, and other papers in relation to lands which may have been or may hereafter be taken and sworn to anywhere in the United States shall be accepted.

The Secretary of the Interior may cause to be appraised and sold the timber on the public lands, in such quantities as he may prescribe, to be used in the Territory, but not for export purposes.

The President is authorized to divide the Territory into two or more land districts, and to appoint a register and receiver for each district.

A bill making further provision for the civil government of

the Territory has been presented to Congress and is now under consideration. It may be amended before final adoption. It makes the following provisions:

The temporary seat of government will be at Sitka, but there will be no legislative assembly and no delegate to Congress.

The governor will be appointed and will have such powers as pertain to the governor of a Territory.

A district court is established, with civil and criminal jurisdiction, and three district judges are provided, one presiding in each of the three divisions into which the district is divided. One will preside in Sitka, one at St Michael, and one at Circle City. At least two terms of court shall be held yearly at Sitka and one in each of the other divisions. Special terms may be held, if necessary. The jurisdiction of each division shall extend over the entire district, but the court may change the place of trial from one division to another in certain cases.

The respective judges shall appoint and at pleasure remove commissioners for the district, who shall have the powers and jurisdiction of commissioners of the United States circuit courts. They shall also have the power and exercise the duties of justices of the peace; shall have jurisdiction in all testamentary and probate matters; shall have power to grant writs of *habeas corpus;* shall have the power of notaries public; and shall have, when acting as justices of the peace, jurisdiction in suits, not affecting titles, where the value involved is not over $1,000.

Three clerks shall be appointed, one for each of the three divisions of the court. There shall also be three district attorneys.

There shall be a marshal, who shall appoint a chief deputy marshal for each division.

The governor, with a salary of $4,000; attorneys, $4,000; judges, $6,000; clerks, $2,500, and marshal, $4,000, shall be appointed by the President, and shall hold office for four years.

The commissioners shall receive double the usual fees of United States commissioners and of justices of the peace in Oregon; the chief deputy and deputy marshals, double the usual fees of constables and deputy marshals in Oregon.

The judges of the district shall divide it into three recording divisions, and each court may establish in its division one or more recording districts, in which a commissioner shall act as recorder, while the clerk of the court shall be *ex officio* recorder in any part of the district not so established.

Notices of location of mining claims shall be filed for record within 90 days from the date of discovery, and shall be recorded in the recording district wherein the claim is situated.

The President is empowered to establish or discontinue land districts, and to appoint a register and receiver for each district so established.

The United States mining laws shall continue applicable to the Territory.

Natives of the Dominion of Canada shall be accorded the same mining

rights and privileges as are given to Americans in British Columbia and the Northwest Territory.

Nothing in the act shall be construed to put in force the general land laws of the United States.

The general laws of the State of Oregon in force January 1, 1894, are declared to be the law in the Territory.

SOME OF THE CONDITIONS AND POSSIBILITIES OF AGRICULTURE IN ALASKA

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During the summer of 1897 the Secretary of Agriculture, acting under authority from Congress, commissioned Dr Sheldon Jackson, of the U. S. Bureau of Education; Mr Benton Killin, one of the regents of the Oregon Agricultural College, and the writer to investigate the agricultural conditions and possibilities of Alaska. The report of this commission has been made to Congress, and it has been issued as Bulletin 48 of the Office of Experiment Stations of the Department of Agriculture. Dr Jackson made a preliminary report on the Yukon valley, while the other commissioners reported their observations along the coast from Dixon entrance to Unalaska. The following account consists in the main of an abstract of the fuller report.

From the information gained it appears that successful attempts have been made at a number of places along the Yukon river to raise hardy vegetables. Potatoes, turnips, cabbage, cauliflower, radishes, lettuce, peas, etc., have been cultivated to considerable extent, some of them having been grown as far north as Circle City and Dawson. Berries abound in the interior, as they do along the coast, and grasses suitable for grazing and hay were met with nearly everywhere. Specimens of good hay grasses more than six feet tall were secured from the vicinity of Circle City.

Mr William Ogilvie, who is connected with the Land Survey of the Dominion of Canada, estimates the agricultural area of the upper Yukon at about 460,000 acres. It is possible that the growing of vegetables could be considerably extended in this region.

As the observations of the writer were confined to the coast region, that portion of Alaska will be considered more in detail.

Considered from an agricultural standpoint, the coast region is divided by a wide stretch of mountains, embracing the St Elias and Fairweather ranges, into two rather characteristic regions, a timbered and a treeless region. The southeast or wooded region embraces the great Alexandrian archipelago, which consists of more than 1,000 islands, and the mainland as far as Juneau. The second or southwestern region, much of which is barren of trees, extends from Cook inlet along the Alaskan peninsula westward, including the Aleutian archipelago, Kadiak, and the neighboring islands, the Shumagin group, and numerous other smaller islands. The northern and northeastern part of this region contains some timber, but in general the region is characterized by its remarkable wealth of grasses. Toward the western portion of this area the arborescent flora disappears entirely or is represented by a few small, stunted shrubs, mostly willows.

Without entering into a general discussion of the meteorology of Alaska, attention may be called to two important facts: First, that the sum of effective temperatures for certain points in the coast region, although somewhat low, surpasses the effective temperatures of several localities in Europe of known agricultural capabilities; and, second, that although the total annual precipitation is large, there is only one point at which as much as one-third of it falls during the summer months. The summer rainfall at Wrangell, Pyramid Harbor, and Killisnoo is less than that at Indianapolis, Ind., Raleigh, N. C., or Washington, D. C.

The soils of Alaska to a great extent are of vegetable origin and to a considerable degree resemble what are called the rice lands of the South or the peat formations of Europe and elsewhere. In some places in southeastern Alaska there are deep deposits of this rich-looking soil overlying slate or conglomerate bed rock, with often a deposit of gravel intervening. Sometimes there is an impervious stratum of clay underlying the black soil. Where the soil lies directly on bed rock or is underlain with clay, the drainage is usually poor and the land more or less marshy.

Samples of what appeared to be average soils were collected at various places and transmitted to the Division of Soils of the Department of Agriculture. In commenting upon the character of the samples analyzed, Professor Milton Whitney says:

> The organic content of many of these soils is very much higher than in any of the agricultural lands of the States. They correspond very nearly with the rice lands and peat formations. The black soils of the plains and the famous Red River Valley soils of the Northwest contain from 8

to 10 per cent of organic matter, but seldom more. If these soils are so situated as to be well drained, they should be capable of producing enormous crops, and with an abundant and well-distributed rainfall they would be adapted to almost any kind of crop suited to the general climatic conditions of that portion of the country.

In several places complaints were heard of a decided acidity of the soil, but no definite information could be secured relating to it. In one place the addition of a large amount of lime to a small plat had corrected the evil complained of.

Peat formations are of considerable extent in southeastern Alaska. In the southwestern portion of the country volcanic material adds to the fertility and porosity of the soil in many places. In the Cook Inlet region the drainage is usually good, the soil overlying deep deposits of gravel. Another characteristic soil formation is that which is so conspicuously illustrated by the tide flats of the Copper and Stikine rivers. These places are more or less marshy and are subject to overflow at high tides. Where protected from the encroachment of the sea and sufficiently drained they are generally considered as very productive soils.

In the southeastern portion of Alaska the Sitkan spruce (*Picea sitchensis*) and the hemlock (*Tsuga mertensiana*) abound, now one and then the other predominating. They grow from tidewater to timber line, an elevation varying from 2,000 to 4,000 feet, and in some places the trees attain considerable size. Specimens of the Sitkan spruce were seen that were at least 8 feet in diameter and probably more than 200 feet high. Logs of this species were seen at the Wrangell saw-mill that approximated 100 feet in length, with an average diameter of more than 4 feet. At different places in the southeastern region the so-called red and yellow cedar (*Thuja gigantea* and *Chamæcyparis nootkatensis*) abound, usually at some little elevation from the sea, although trees of considerable size were seen almost at sea level. Seldom do these trees occur in such abundance as to wholly exclude other species. Another spruce (*Tsuga pattoni*) was observed, but not in great abundance. But a single species of pine (*Pinus contorta*) was seen, and that was almost invariably found on the flats or on the edge of bogs. Two species of alder (*Alnus oregona* and *A. viridis*) were common along the streams and on the mountain sides where snowslides have swept away the dense growth of moss and conifers. Willows are common, but seldom were they seen to attain the dignity of trees.

In the north and northeastern portion of what has been designated the southwestern part of the coast region some spruce (*Picea sitchensis*) and cottonwood (*Populus balsamea*) occur, the trees frequently attaining a considerable size. Considerable birch (*Betula papyrifera*) and perhaps another species occur in the upper part of the Cook Inlet region, but elsewhere the forests of the southwestern coast are very insignificant.

Local demands for lumber and fuel are the principal uses to which the timber is put, and with almost entire exemption from forest fires, the supply, if properly regulated, will be sufficient for all needs of Alaskans for a long time to come.

Next to the timber, perhaps the grasses of Alaska are among the most valuable of the plant products. In all parts of the country they flourish to an extraordinary degree. In southeastern Alaska, wherever the timber is cut away and the undergrowth of the shrubs kept down, a dense growth of grass soon takes place, to the exclusion of all other plants. Of the common grasses timothy (*Phleum pratense*), Alaska red top (*Deschampsia cæspitosa* and *D. bottnica*), blue grass (*Poa pratensis*), orchard grass (*Dactylis glomerata*), wild barley (*Hordeum boreale*), *Calamagrostis aleutica*, and wild ryé (*Elymus mollis* and other species) are the most widely distributed, and are probably the most valuable for pasture and hay. Timothy, orchard grass, and blue grass have become thoroughly established and grow to great size. One of the most common native grasses is the Alaskan red top. It is a prominent factor in nearly all grass mixtures, and frequently exceeds a man in height. Specimens at Sitka, July 5, were a little more than 4 feet in height and just heading. Orchard grass more than 3 feet high was seen as early as June 20. In the western part of Alaska, valley and hillside as far as 1,000 feet or more elevation were green with grass during the time spent in that region.

The most common hay grasses at Kadiak are *Poa pratensis*, *Deschampsia cæspitosa*, and *Hordeum boreale*, with some wild timothy (*Phleum alpinum*). *Calamagrostis langsdorfii* was the most abundant hay grass observed in Cook inlet. At Unalaska the common pasture and hay grasses appear to be *Trisetum subspicatum* and *Calamagrostis aleutica*.

White clover was seen in many of the small meadows and door-yards, from which places it seems to be rapidly spreading. Some red clover was also seen, but its adaptability to Alaskan conditions can neither be affirmed nor denied, since apparently

no thorough attempt has been made to introduce it. In a few places alfalfa was also seen that was beginning to seed in August.

On the tide flats dense growths of sedges are common, and in some places a very common vetch (*Vicia gigantea*) occurs, and if utilized it would add considerable to the feeding value of the marsh hay.

The nutritious character of the Alaskan grasses was not only shown by their analyses, but also by the sleek and fat cattle seen during the summer. Aside from pasturage, but little use is made of the grasses. The amount of hay that is made is wholly inadequate, and much more could undoubtedly be had if more care be given the subject.

The abundance of berries in Alaska has been a subject of remark by every one who has written concerning this country. So far as could be learned, but little attention has been given to their cultivation, but the few attempts that have been made seem to promise favorably. Hardly any berries are cultivated, except a few strawberries, currants, and raspberries, and of these both wild and cultivated forms were seen growing, and the adaptability of the wild plants to domestication was very evident. The wild strawberry was seen under cultivation at Wrangell, and specimens of *Rubus stellatus*, known as dewberry, "Morong" and "Knesheneka," were seen growing in a garden at Sitka, and it seems probable that more could be done in this line.

The flavor of most Alaskan berries was found to be excellent, and some of them might be worthy of introduction into the States.

Of the berries which have widest distribution may be mentioned the salmon berry (*Rubus spectabilis*), two kinds of cranberries, the high-bush (*Viburnum pauciflorum*) and the little cranberry (*Vaccinium vitis-idæa*), the red and black currant (*Ribes rubrum* and *R. laxiflorum*), crowberries (*Empetrum nigrum*), huckleberries (*Vaccinium uliginosum* and its variety *mucronatum*), raspberries (*Rubus strigosus*), elderberries (*Sambucus racemosa*), bunchberries (*Cornus canadensis* and *C. suecica*), and the "Molka" or baked apple berry (*Rubus chamæmorus*). Of less general distribution are strawberries (*Fragaria chiloensis*), dewberries (*Rubus stellatus*), thimbleberries (*R. parviflorus*), salalberries (*Gaultheria shallon*), bog cranberries (*Vaccinium oxycoccus*), wine or bear berries (*Arctostaphylus alpina*), etc. These berries are used in many ways by the native and white population, and in addition to the consumption of fresh berries many are stored

up in various ways for winter use. The white population preserve, can, and make jelly of the different kinds, while among the natives the principal method of preserving them is in seal oil, a vessel filled with berries preserved in this way forming a gift that is usually highly prized.

Numerous miscellaneous plants are used for food. Among the more common are the Labrador or Hudson Bay tea (*Ledum grœnlandicum*); wild rice or "koo," the underground bulbs of which are dried, powdered, and made into a sort of cake; wild peas are employed to some extent, and several species of mushrooms are collected for use. Quite a number of plants are used as pot herbs, and the medicinal value of others is recognized.

Cultivated areas in Alaska are, with the exception of one or two notable instances, confined to kitchen gardens, in which are grown many of the hardier vegetables of our own gardens, such as lettuce, radishes, carrots, parsnips, potatoes, onions, peas, snap beans, celery, turnips, cauliflower, cabbage, rhubarb, horse-radish, etc., in most places the local supply of radishes, lettuce, turnips, and carrots being about equal to the demand.

It is a subject of dispute whether or not potatoes mature in Alaska. Under the methods of culture adopted in Alaska it is very probable that a dry starchy potato is not secured, as potato tops seen late in the fall were still quite green. In Cook inlet and on Kadiak island, as well as elsewhere, the natives grow a small round potato, the original stock of which is said to have come from Russia or Siberia, and so far as could be learned it is the same now as it was fifty or one hundred years ago. No trouble was reported in securing sufficiently mature tubers so that the seed could be kept over from one season to another. Among some specimens of vegetables sent to the Department of Agriculture by Mr Frederick Sargent, of Kadiak, were some potatoes, specimens of which weighed a pound each. No doubt these were larger than the average, but it certainly disposes of the stock idea "that potatoes will not grow larger than walnuts in Alaska."

Complaints were heard in some places that cabbage and cauliflower would not head. There occasionally appears to be some ground for this, but 16-pound cabbages from Killisnoo and 24-pound cauliflowers from Wrangell would rather indicate that in some places these plants do well. Local conditions may cause failures of these crops, just as seems to be the case with several others. Localities were visited where it was said that onions

would not grow; others where beets could not be raised; but both of these vegetables were seen in flourishing conditions elsewhere. In a few places where attempts have been made to grow peas and snap beans the efforts have been apparently quite successful. When the peas are gathered at frequent intervals, the vines are said to bear for an extra long period. Specimens of a so called dwarf pea were seen at Wrangell that had grown to a height of 3 feet. Whether this was due to a mistake in the variety or to the climate and soil cannot be determined. During the past summer cucumbers are reported to have been grown at Tyoonock, but none were seen when that place was visited.

But little appears to have been done in attempting to grow cereals throughout the whole country. It is reported that during the Russian régime spasmodic attempts were made to do something in the line of promoting agriculture, but it appears that nothing of a permanent nature was accomplished. At Yakutat, on the site of the old town, an agricultural colony was established, and at various places in Cook inlet the same was attempted. It is claimed that during Russian occupation oats, rye, barley, and buckwheat were grown to a considerable extent, but if this is true there are now no traces of the fields where the grain was formerly cultivated.

The few cereals seen growing were for the most part self-seeded from hay, feed, etc. At Wood island and Kadiak mature oats were seen August 22 that had evidently grown from seed scattered from feed or packing. A few specimens of barley were seen at one of the places that were about 15 inches high, headed but not ripe. Their origin was probably due to the same causes as that of the oats.

At Tyoonock a limited experiment was made during the last summer with spring-sown wheat, rye, and barley, and on the last day of July the barley and rye were about 15 to 18 inches high and fully headed out. The wheat had made a fine growth, but showed no tendency to head. At Sitka, in 1896, a small plat of wheat was ripened in fairly good condition, and in 1897, at the same place, a plat of flax was sown, and on September 4 the plants averaged about 30 inches in height and were in full bloom, the earlier capsules containing almost mature seed.

About the only real farm in the country is on an island between Juneau and Sitka, near the village of Killisnoo. It consists of about 40 acres under cultivation, and has been under cultivation for about three years. The equipment of stock con-

sists of a team of horses, 6 head of cattle, and about 30 hogs. Part of the land was tide land, and dikes have been built to keep out the sea. Turnips, peas, cabbage, potatoes, Swedish turnips, beets, etc., are now grown extensively. The crop for this year consisted of about 7 tons of potatoes, 20 tons of Swedish turnips, several tons each of beets, carrots, parsnips, and a large quantity of peas. Two silos are maintained at this place, and the owner is able to carry his stock through the winter in very good condition. He supplies some milk and meat as well as vegetables to the village of Killisnoo, where there is a fish-oil and guano factory, and also to the steamers touching there during the season.

For the most part the same methods of cultivation are pursued throughout nearly the entire country. The generally neglected appearance of gardens is everywhere apparent. It is not confined to the garden of the native, but too often that of the white man is as poorly cared for. Often a vast amount of labor is expended in planting the crop; but once planted, it is allowed to care for itself. The result is a large and luxuriant crop of weeds.

Bedding up the soil is practiced nearly everywhere. On the lighter and better drained soils it is not as necessary as on the heavy, poorly drained ones. Usually the beds are formed about 3 or 4 feet wide and raised as high above the general level as can be economically done. Most crops are planted in rows across the beds, the distance separating the individual plants varying according to the crop. Close planting seems to be the rule with nearly every crop. The attempt seems to be to secure the largest possible harvest from a limited area by planting a large amount of seed. Potatoes are not infrequently planted 6 inches apart in rows separated not more than a foot. The result of such planting is a thick growth of vines that covers the ground to such an extent that the sun's rays never reach the ground. Such methods can hardly fail to produce a yield of very inferior tubers.

At present stock-raising is carried on to a very limited extent, milch cows being the most common farm animal seen. At nearly every village there were seen some cows, pigs, and poultry, while horses are kept at a few of the larger places. The team at the Killisnoo farm is probably the only team in Alaska employed in agriculture, the other horses being used for teaming around the towns and packing around mining camps. At several places dairies are maintained, supplies of milk and a small quantity of butter being furnished most of the year. At Kadiak some years ago an attempt was made to introduce

sheep. Quite a number were placed on a small island, and, as they had come from a much warmer and a drier region, many died during the winter in consequence of being poorly fed and not provided with shelter.

Pigs are reported to thrive exceedingly well in most parts of Alaska, but when allowed to run at large their flesh is liable to acquire a fishy flavor. The same objection is raised against the flesh of fowls, since their diet in winter consists almost entirely of fish refuse.

The prevailing conception of Alaska as a region wholly given up to glaciers and mountains is strikingly at variance with the facts. In 1894 the director of the Geological Survey estimated the tillable land in southeastern and southwestern Alaska as embracing between 4,000 and 5,000 square miles, or from 2,500,000 to 3,200,000 acres, an area about equal to that of the State of Connecticut. If the grazing lands be added to the above estimate, the acreage would be greatly extended.

The agriculturist of Alaska will have some serious problems to consider. The more important are the clearing and draining of the land, lack of markets, and transportation facilities.

In southeastern Alaska, with the exception of the tide flats, land must first be cleared of the dense forest growth, and in some places the deep moss will also have to be removed. The spruce stumps must be dug out, as they are very slow in rotting, and not infrequently produce large second-growth timber. In addition to clearing, the land must be thoroughly drained and protected against seepage from above. This ditching and removal of stumps is very laborious, and estimates of $200 per acre were given as a probable cost of preparing the soil for cultivation. This cost seems well nigh prohibitive for agricultural purposes. However, the same process had to be followed elsewhere. A report issued by the experiment station at Pullman, Washington, states the cost of clearing muck lands of cedar and alder stumps at the Puyallup substation to be $122.80 per acre. No definite information has been obtainable as to the cost of clearing farm land elsewhere, but wherever practiced the process is expensive. In the southwestern portion of the country the expense of clearing away the stumps will not be required, nor is draining necessary to the same extent as in the other region.

The agricultural possibilities of Alaska can be estimated only from the rather meager evidence of limited experiment, and by

comparing what has been accomplished in regions having somewhat similar conditions. Agriculture as it exists in Alaska has been described in the previous pages. It is not expected that this country will ever rival the Mississippi valley in its productiveness, but it does seem probable that agriculture and horticulture could be extended so as to supply local demands for many products. When the climatic conditions, topography, soils, etc., of Norway, Iceland, the Orkney islands, as well as Scotland, Sweden, and Finland, are compared with those of Alaska, it seems probable that what has been accomplished in European stations could also be done in this country, if properly undertaken. It is well established that many agricultural products flourish in parts of northern Europe having approximately the same temperature during the growing season as we find to exist in portions of Alaska, and if temperature is the controlling factor in plant distribution there would seem no reason why the same varieties of plants would not succeed in both countries if properly introduced and cultivated. Rye, oats, and barley are grown in sufficient abundance in the north of Europe, not only to supply local demands, but also to some extent for export.

Comparing Alaskan data, secured from agricultural experiments that have not always been conducted in the best manner, with the results secured from other regions having a somewhat comparable climate, it seems safe to say that the coast region of Alaska possesses agricultural possibilities of no little importance, and with an enlightened native population and a permanent white one it seems possible that the demand for many of the agricultural products could be supplied.

THE METLAKATLA MISSION IN DANGER

The history of missions from the earliest epoch has been a struggle, not only against the natural obstacles of the situation, but against the indifference or criticism of opponents in the rear. It is not difficult to criticise, "For John came neither eating nor drinking, and they say, He hath a devil. The Son of Man came eating and drinking, and they say, Behold a man gluttonous, and a winebibber, a friend of publicans and sinners."

There are two modes of mission work among the Indians; one which draws its sinews of war from friends in the churches and sends out salaried missionaries, who devote themselves to

teaching and the work of conversion. The teachers often lack in practicality what they make up in devotion to the ideal. Nevertheless it would be folly to deny that these missions have done much good in their way, and will continue to do so. Of them the scoffer says: "The missionaries live at their ease and do nothing for it but teach dogmas which the Indian cannot understand, and train girls to be good housewives, who, when their education is completed, will be sold by their heathen relatives to some miner or trader. When the mission is closed for want of funds or otherwise, the converts relapse into evil ways, and in a little while their last state is worse than their first." That there have been instances justifying to some degree this harsh view, every one familiar with Indian missions will admit.

The other method is to fit the Indians to provide for themselves and for the mission by industrial training, self-denial, and hard work, shielding them in the early stages as we shield our own children from contact with evil men and things until, stimulated both by their own material interests and by the truths of the gospel, in the course of time and growth they shall be able to stand alone, men among men, to fight the battles of life. This is the method of Hampton and Carlisle, whose most conspicuous exponent on the uncivilized frontier is the Rev. William Duncan, of Metlakatla, Annette island, Alaska. This gentleman has given forty years of his life to the work among the Tsimsian Indians, first at Metlakatla, on the British Columbia side of the line. Through a most injudicious exercise of religious narrow-mindedness, well known, but of which there is insufficient space to speak here, the Indians were obliged to abandon their homes, church, and school and much other property and move over into American territory at Annette island to obtain freedom of religious worship. Here, several years later, Congress granted them the use of the island, and, in confidence that they were at last safe from interference, under Duncan's direction they went heartily to work. His plan was, in brief, to keep the colony together and free from undesirable elements, liquor and vice; to teach them to utilize the resources of the region to support themselves and their families by work; to build good houses and maintain family life as known to civilization, and to teach the English branches and manual training to the young people.

In pursuance of this ideal, Mr Duncan put his own means and contributions of friends into the outfit of a salmon cannery which has been worked by the Indians, as well as a saw mill and other

correlated facilities. The success has been complete. The colony has maintained itself, some of the Indians have become shareholders, and the canning business has yielded a good profit. The evidence of this is overwhelming and includes the testimony of almost every disinterested person who has visited the colony. Even the scoffers admit that as a business enterprise the mission is a great success. Its very success has become a source of danger. Business competition is nowhere sharper than in Alaska, because the ordinary safeguards of public opinion and well enforced law are not available in restraint of greed and sharp practice. Most of the canneries are included in a trust, and outsiders have scant consideration and must fight for their interests unceasingly and at great disadvantage. Nothing which might hurt the sensitive feelings of the trust can be found in the published reports of the official salmon inspectors; yet it is the common opinion that the law is violated systematically, except during the visits of the inspectors for a few hours during the whole season.

Like all the Alaskan islands, Annette island contains a few quartz veins. There is good reason to think that none of them is of any great value, and no development work, such as is required by law, has been done on any of them. Under the reservation of Congress the prospectors could not acquire any rights, at any rate. But an attempt is now being made to induce Congress to bolster up a speculation in these undeveloped leads by rescinding the reservation act, so as to cut off from the colony its waterworks, its mill and cannery, and to a large extent its fishery rights, and thus leave the people without resources and open to the vices of the mining camp and rumseller, to the inevitable destruction of all that has been hitherto accomplished.

The bare statement of the facts carries its own commentary. The friends of justice, and of the Indian's right to work out his salvation, and eventually to take his place among the citizens of our common country, should make themselves heard before it is too late. WM. H. DALL.

AGRICULTURE IN THE YUKON VALLEY

In a brief preliminary report on the agricultural and horticultural conditions in the Yukon valley, Dr Sheldon Jackson mentions having found at the Roman Catholic mission at Koserefski, 338 miles from the mouth of the river, and at the Protest-

ant Episcopal mission at Anvik, 17 miles higher up the stream, gardens producing potatoes (7 or 8 inches long and 3 inches in diameter), turnips weighing 10 pounds, cauliflower, radishes, cabbage, lettuce, carrots, beets, and peas, while strawberries, blackberries, raspberries, and other well-known small fruits were growing wild in the immediate vicinity. At Circle City, 1,322 miles up the river, and at Fort Cudahy, 1,522 miles up, many favorite varieties of garden truck seemed to be thriving. Dr Jackson sums up his statement in the following words: "While Alaska will never be an agricultural state in the same sense in which that term is understood in the Mississippi valley, yet it has agricultural capacities much in advance of the public sentiment of the country."

ON ESKIMO GEOGRAPHIC NAMES ENDING IN MIUT

Mr Charles Hallock, in his article on the Kuskokwim river, in THE NATIONAL GEOGRAPHIC MAGAZINE for March, 1898, enumerates a number of names of Eskimo settlements on the river, all ending in *mute*, and explains (on p. 88) that "*mute* means village." This is not really a translation of the affix, although words with this termination appear to be very generally used as village names in that part of Alaska—at least, by white men. Strictly speaking, such names are not applicable to the village itself, but to the inhabitants of the village, for the termination, which properly should be written *miut*, is simply the plural of the well-known Eskimo enclitic affix *mio*, "he who dwells," or "that which belongs" (in any place), which is found wherever any dialect of the Eskimo language is spoken. In Greenland these names are applied only to the inhabitants of single village sites, as, for example, Nûngmiut, "the people of Godthaab;" but in the central region and in northwestern Alaska they are applied sometimes to more extended regions, and thus serve as a kind of tribal name. For instance, the Point Barrow Eskimos call the people of the Mackenzie delta collectively Kupangmiun, "the people who live on the great river."

This termination should always be written *miut* (or *miun* in the northwestern dialects), but appears in the writings of different explorers in several incorrect forms, such as *mute*, mūt, *meut*, or *meun*.

JOHN MURDOCH,

Boston Public Library.

GEOGRAPHIC LITERATURE

Geographical and Statistical Notes on Mexico. By Matias Romero. Pp. xiv + 286. New York: G. P. Putnam's Sons.

The modest title conveys an inadequate idea of the scope of this book, which is a compendium of useful and interesting data as to the resources and commercial progress of our sister Republic. The high official position of Señor Romero has procured for him data inaccessible to most writers, while his long diplomatic service in the United States has enabled him to select wisely the statistical matter herein presented. He treats clearly, from original sources, mining, railways, revenues and expenditures, foreign trade in general, and especially the commercial relations between Mexico and the United States, the data in many cases extending to 1897. The volume closes with an interesting article on "The Drainage of the Valley of Mexico," a problem that for 500 years baffled the local engineers, but which, now finally resolved, will be practically completed in June, 1898.

The subject of railways occupies the most space, as is proper, they constituting the most potent factor in the late astonishing development of Mexico. Señor Romero's account of the mining industries will command attention, not only from the interesting manner in which it is presented, but also from the pr dominating part played by silver in late years. Mexico has coined silver to the value of $3,530,000,000, and has used one-fourth as much more in the arts, etc.

The coinage during the colonial period (1537–1821) averaged annually $7,500,000, during the independence (1822–'73) $15,600,000, and under the republic $24,700,000. It is estimated that the annual output of silver in Mexico will ultimately reach $100,000,000.

The commercial relations between Mexico and the United States are treated fully, and the statistical tables illustrate forcibly the steadily increasing trend of Mexican trade toward this country. In 1872–'73, the first regular report of the Mexican statistical bureau, the imports from the United States were valued at $6,430,000, in 1896–'97 they amounted to $23,535,000, consisting principally of manufactures of metal, wood, and cotton, and raw cotton, although corn figured largely, owing to the failure of the crop in Mexico. In the same years Mexico exported to the United States $16,430,000 (1872–'73), and $30,714,000 (1896–'97). The increase in exports is almost entirely in merchandise, the principal articles being copper, coffee, and fibers.

The excellencies of Mexican climates scarcely appear in the meager meteorological data presented, and the value of the table on page 89 is impaired by the misprint of 1869 for the correct year, 1896. It is much to be regretted that so valuable a publication has no general map.

A. W. G.

Map of Alaska, showing known Gold-bearing Rocks, with Descriptive Text containing Sketches of the Geography, Geology, Gold Deposits and Routes to the Gold Fields. U. S. Geological Survey. Pp. 44. Washington. 1898.

A Report to Congress on Agriculture in Alaska, including Reports by Walter H. Evans, Benton Killin, and Sheldon Jackson. U. S. Department of Agriculture, Office of Experiment Stations. Bulletin No. 48. Pp. iv + 36, with map and illustrations. Washington. 1898.

Rand, McNally & Co.'s New 18 × 24 Map of Alaska, showing also British Columbia, with portions of Northwest Territories, etc. Chicago and New York: Rand, McNally & Company. 1897.

Rand, McNally & Co.'s Official Map of Alaska, including The Klondike District and Adjacent Gold Fields, showing various routes to the mines. 24 × 36, cloth. Chicago and New York: Rand, McNally & Co. 1897.

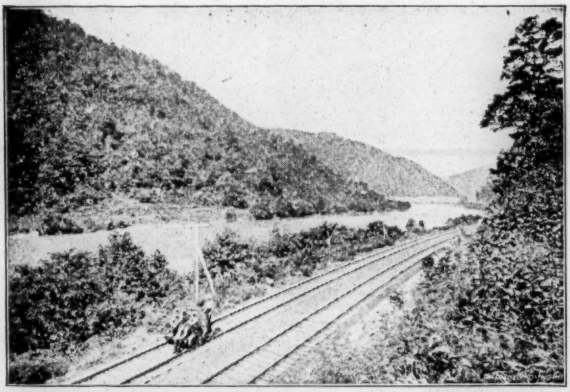
Golden Alaska. An Up-to-Date Guide. Klondike District. Yukon Valley. By Ernest Ingersoll. Pp. v + 160, with maps and illustrations. Chicago and New York: Rand, McNally & Company. 1897.

The Golden North. By C. R. Tuttle. Pp. x + 307, with maps. Chicago and New York: Rand, McNally & Company. 1897.

Nothing could be more timely or, for their purpose, more valuable than the reports on Alaska recently published by the U. S. Geological Survey and the U. S. Department of Agriculture, the one on the mineral resources of the Territory and the other on its agricultural capabilities. While there is still much awaiting demonstration in both these fields of investigation, enough is definitely known to prove of the utmost utility to those who are seeking their fortune in the new Eldorado. The principal authors of both reports have rendered the readers of THE NATIONAL GEOGRAPHIC MAGAZINE the service of summarizing the results of their investigations for this number, but the reports themselves should be carefully studied by all prospective visitors to the region described.

The reputation of the well-known firm of Rand, McNally & Co. is fully maintained in their recent publications on Alaska and the Klondike. Their "18 by 24 map" shows in considerable detail the whole of Alaska and the western portion of the Dominion of Canada, and notwithstanding the small scale on which it is drawn, it is clear and distinct in every particular. The "official map," while twice the size of the foregoing, embraces a much smaller area, with the result that the different geographical features of the attractive region it represents stand out with a distinctness that leaves nothing to be desired. Mr Ernest Ingersoll's "Golden Alaska" contains much useful information for intending settlers, but is hardly up to the author's usual standard in its literary style. Mr Tuttle's "The Golden North" is a somewhat more ambitious and more serious work and not so obviously designed to meet a merely temporary want. While the two publications necessarily cover to some extent the same ground, each has its place, and the two books are really complementary to each other.

J. H.



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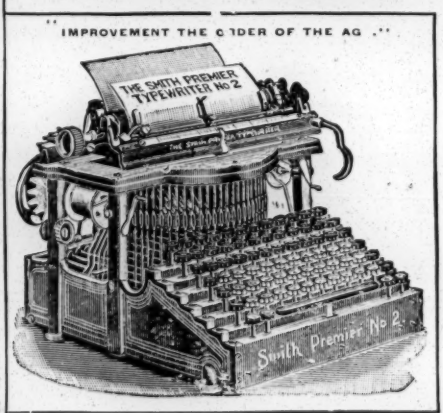

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